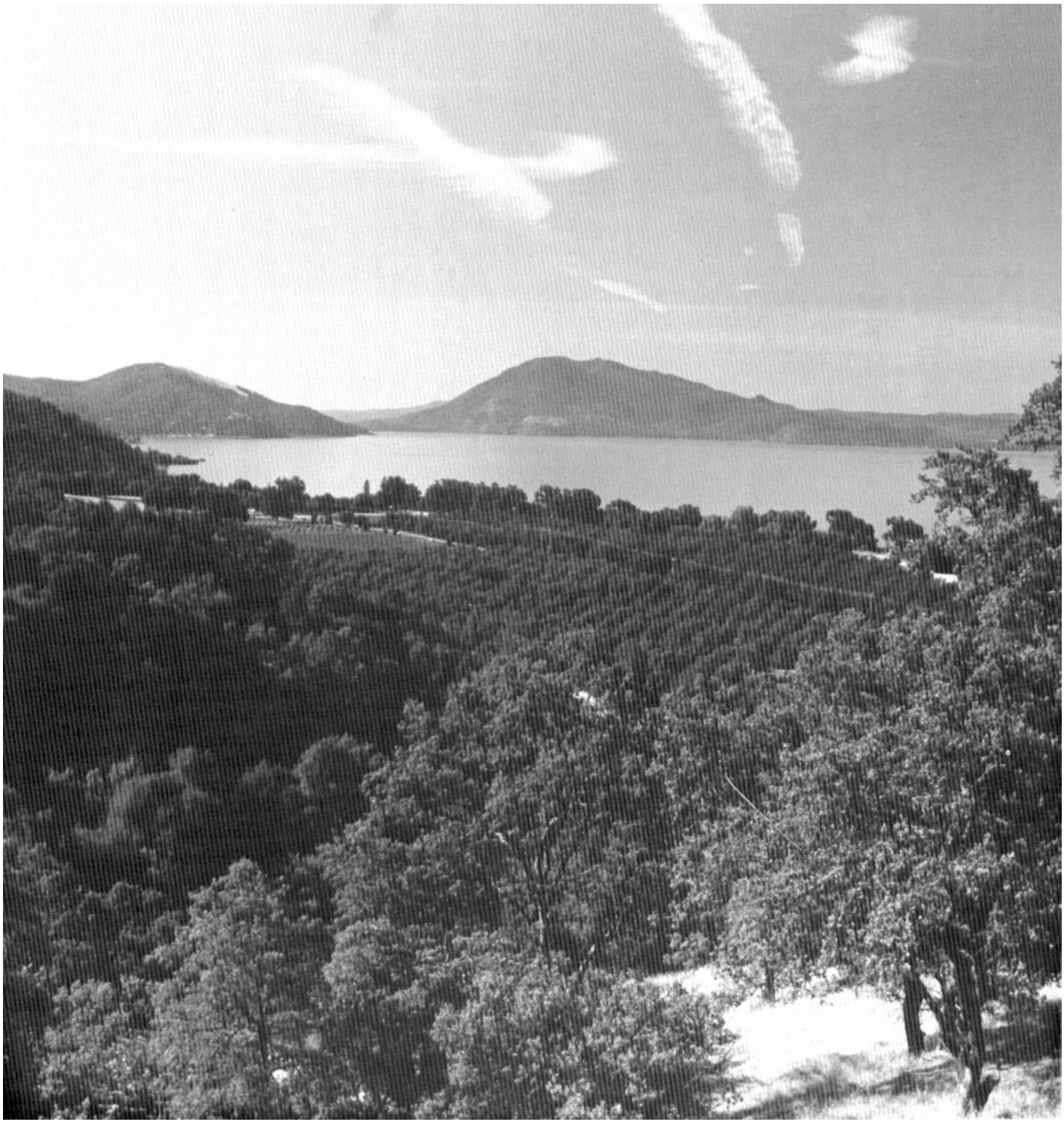
United States Department of Agriculture

Soil Conservation Service

In cooperation with United States Department of Agriculture, Forest Service; United States Department of the Interior, Bureau of Land Management; and the Regents of the University of California (Agricultural Experiment Station)

Soil Survey of Lake County, California



HOW TO USE

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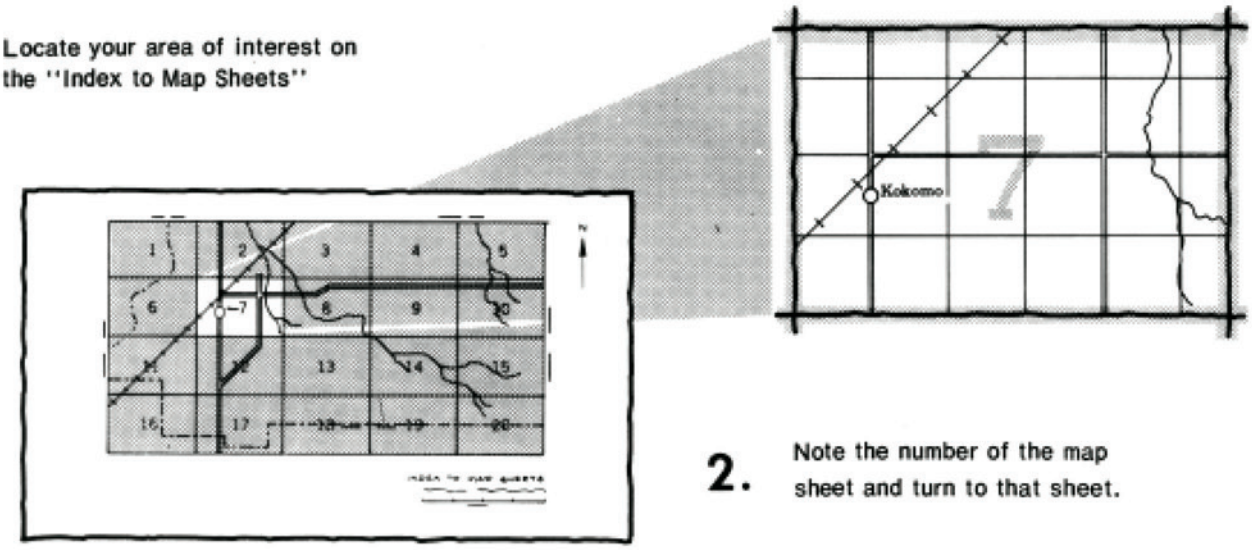

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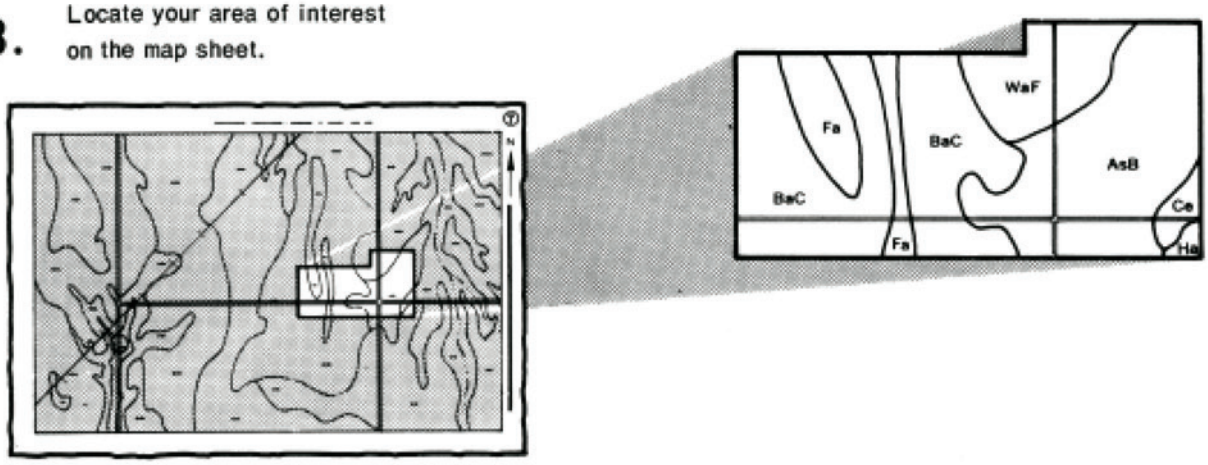

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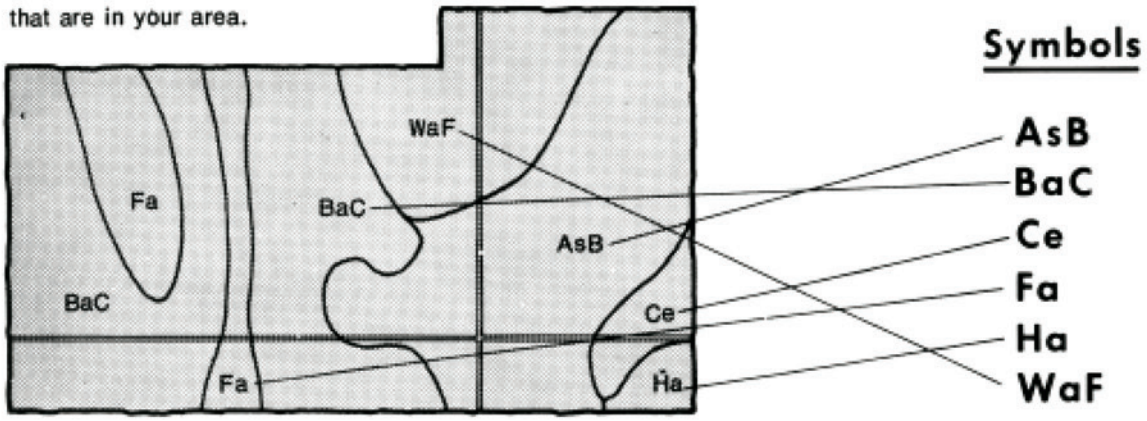
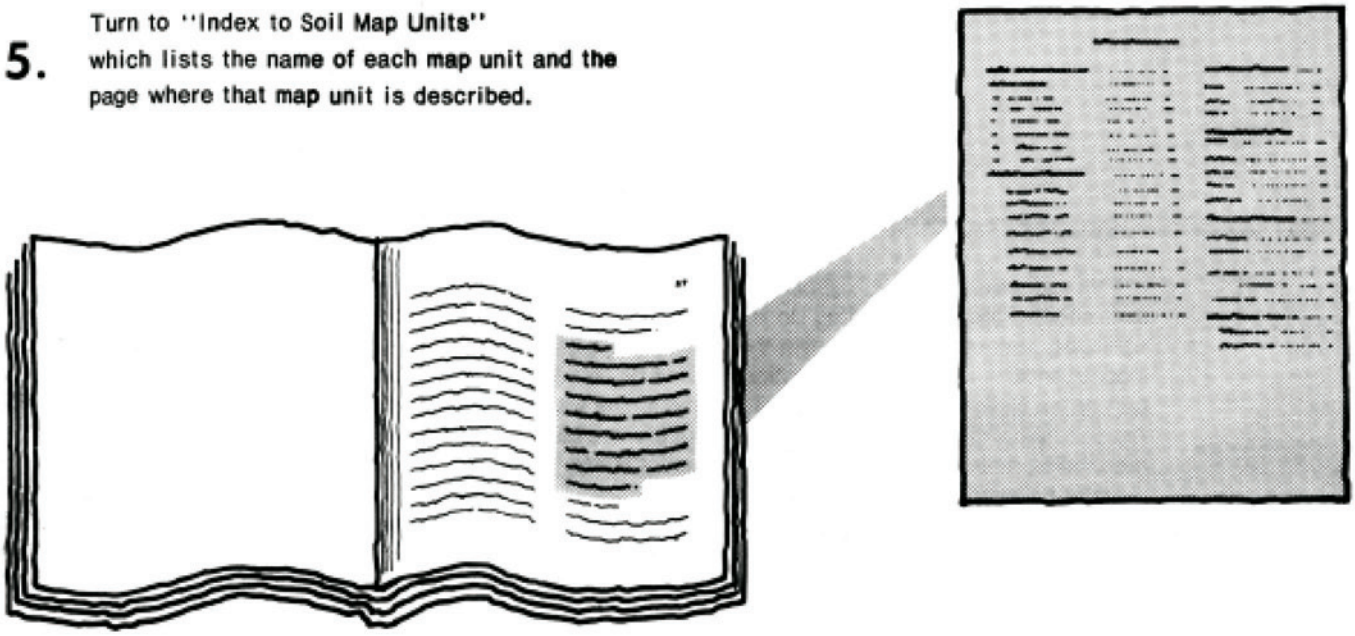
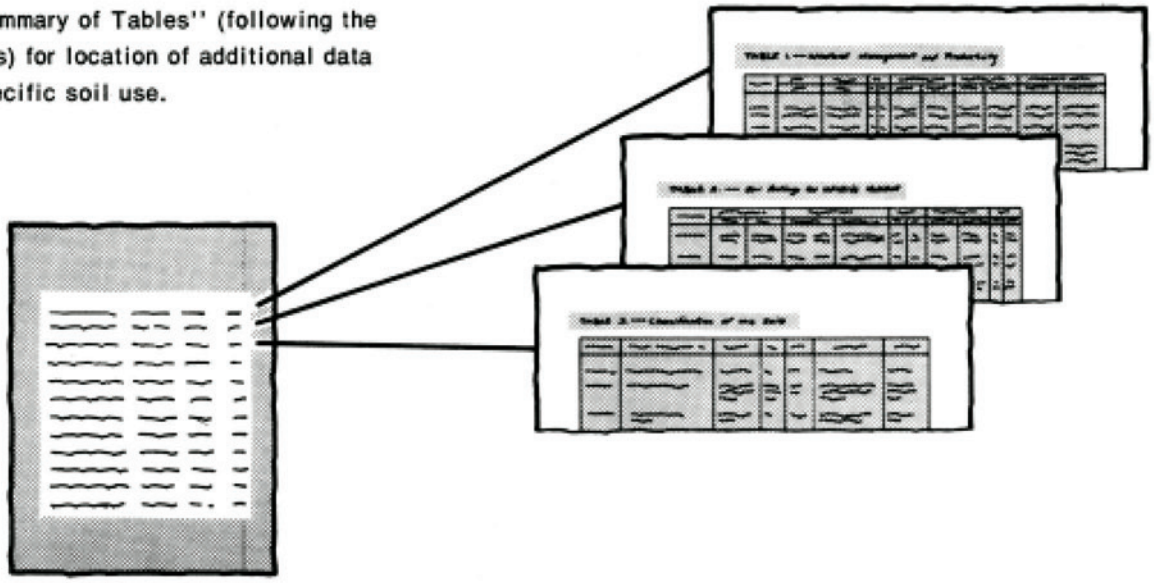


THIS SOIL SURVEY

5. Turn to "Index to Soil Map Units" which lists the name of each map unit and the page where that map unit is described.



6. See "Summary of Tables" (following the Contents) for location of additional data on a specific soil use.



7. Consult "Contents" for parts of the publication that will meet your specific needs. This survey contains useful information for farmers or ranchers, foresters or agronomists; for planners, community decision makers, engineers, developers, builders, or homebuyers; for conservationists, recreationists, teachers, or students; to specialists in wildlife management, waste disposal, or pollution control.

This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other federal agencies, state agencies including the Agricultural Experiment Stations, and local agencies. The Soil Conservation Service has leadership for the federal part of the National Cooperative Soil Survey. In line with Department of Agriculture policies, benefits of this program are available to all, regardless of race, color, national origin, sex, religion, marital status, handicap, or age.

Major fieldwork for this soil survey was completed in 1981. Soil names and descriptions were approved in 1983. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1982. This survey was made cooperatively by the Soil Conservation Service, the Forest Service, the Bureau of Land Management, and the Regents of the University of California (Agricultural Experiment Station). It is part of the technical assistance furnished to the East Lake and the West Lake Resource Conservation Districts.

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

Cover: Typical area of Lake County, California. Millsholm-Bressa-Hopland association, 30 to 50 percent slopes, in foreground; Cole Variant clay loam and Still loam adjacent to Clear Lake; and Mount Konocti in background.

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Preface

This soil survey contains information that can be used in land-planning programs in Lake County, California. It contains predictions of soil behavior for selected land uses. The survey also highlights limitations and hazards inherent in the soil, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, foresters, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Soil Conservation Service or the Cooperative Extension Service.

Location of Lake County in California.

Soil Survey of
Lake County, California

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United States Department of Agriculture, Soil Conservation Service
In cooperation with
United States Department of Agriculture, Forest Service;
United States Department of the Interior, Bureau of Land Management;
and the Regents of the University of California
(Agricultural Experiment Station)

LAKE COUNTY is in the northwestern part of California. It has a land area of about 806,976 acres, or 1,261 square miles. About 31 percent of the county is in the Mendocino National Forest, and about 17 percent is other Federal and State administered land. The population in 1981 was about 39,600. It is estimated that the county receives more than 200,000 tourists annually. Lakeport, the county seat, is on the western shore of Clear Lake, which is near the center of the county.

The county is predominantly hilly and mountainous and has a few broad, flat valleys and several smaller valleys scattered throughout. Clear Lake, with a surface area of 68 square miles, is the largest natural lake that is located entirely within California.

Agriculture and tourism are the main economic enterprises in the county. Timber production, mainly on public land, is also important to the economy. The climate, which is characterized by warm, dry summers and cool, moist winters, is favorable for all of these economic activities.

Soil scientists have determined that there are about 80 different kinds of soil in Lake County. The soils vary widely in depth, texture, natural drainage, and other characteristics. The soils on the hills and mountains are dominantly shallow or moderately deep, medium textured, and moderately well drained or well drained. The soils in the valleys and on low terraces are dominantly deep or very deep, medium textured or fine textured, and poorly drained to well drained.

A survey of the Clear Lake Area was published in 1927 (*26*). Soil-vegetation maps of the county were completed in 1955. Interim reports of the present soil survey were released for the Big Valley, Scotts Valley, and Upper Lake areas in 1979 by the West Lake Resource Conservation District. The present survey updates the earlier surveys and provides additional information and more detailed maps.

The present survey involved detailed mapping on bottom lands and on the low terraces near Lakeport. Less detailed mapping was done in the rangeland, forest land, and brushland areas of the hills and mountains. About 80 percent of the Mendocino National Forest was surveyed by the Forest Service, and 20 percent, in the eastern and southeastern parts, was surveyed by the Soil Conservation Service. All other areas of the county were surveyed by the Soil Conservation Service.

Descriptions, names, and delineations of soils in this soil survey do not fully agree with those on soil maps for adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, intensity of mapping, or the extent of soils within the survey.

General Nature of the Survey Area

This section provides general information about the Lake County soil survey area. It discusses history and development; physiography, relief, and drainage; climate; vegetation; and water supply.

History and Development

The first recorded inhabitants in the survey area were American Indians. They belonged primarily to the Pomo tribe, but there were smaller bands of Miwocs, Wappos, and Wintuns (*13*). These Indians lived around Clear Lake and the many streams in the area. They hunted, fished, and gathered roots, acorns, and berries.

In 1836 a Spanish exploratory expedition lead by Captain Salvador Vallejo came to the area. When the Spaniards left, they took Indian captives with them to work the large ranches in Solano and Sonoma Counties. Vallejo returned in 1840 with herds of horses and longhorn cattle and took informal possession of land near Clear Lake, setting up headquarters in Big Valley. The cattle multiplied and soon ran wild in the valley and surrounding hills. Two pioneers, Andy Kelsey and Charles Stone, came to the area in 1847 (*6*). They bought 800 head of cattle from Vallejo and settled near the present site of Kelseyville. Their alleged mistreatment of the local Indians resulted in them being killed by the Indians in 1849. In retaliation, the U.S. Army surrounded and killed 100 Indians in the spring of 1850 on what is now called Bloody Island, near Upper Lake. For several years no further settlement was attempted in the area because of the unstable relations with the Indians. A treaty was signed in 1851 between the Pomo Indians and the United States Government that deeded all of the land west of the Narrows on Clear Lake to the Indians. When Congress refused to ratify the treaty in 1853, Lake County was reopened for settlement.

The first road into the survey area was a rough dirt road from the Napa Valley to Lower Lake. In 1865 a toll road from Calistoga to Middletown was opened. As the population increased, more roads were built, until a total of 15 toll roads were in operation. Today, Lake County is crossed by four major highways. In the early days, transportation within the county, around Clear Lake, was mostly by boat. Boats were used to visit neighbors and stores, and regularly scheduled routes were used to carry mail, express, and passengers. Railroads never came to the county, and the lack of this mode of commercial transportation limited the exportation and importation of goods in the early years.

The cattle industry in Lake County started with the introduction of the Spanish longhorns, which were used mainly for tallow and hides. In 1854 permanent settlers started arriving with dairy cattle. They hunted the remaining herds of wild longhorns and eventually exterminated them. Today, the emphasis of the local cattle industry is on meat production and breeding. In addition, horses, sheep, goats, swine, poultry, and bees have been raised in Lake County during its history.

The first pears in the county were planted in family orchards, and in 1855 commercial pear orchards were planted in Big Valley. During that same year a fruit exhibit sent to the World's Fair in New Orleans made Lake County Bartlett pears internationally famous. Most pears were dried and shipped out of the county until 1923, when the canning industry started buying large quantities of Lake County Bartlett pears. The first English walnut orchards were planted in Big Valley around the turn of the century.

In the following years Zinfandel, Golden Chasselas, Burger, Gultdal, Reisling, and Muscat vineyards were established around Clear Lake. Wine grape vineyards and the associated wineries flourished until Prohibition. The industry then died out; in the 1960's, however, wine grape vineyards again began to be planted. Today, the wine grape industry in the county is again well established.

The mining industry in the county has had a rich and varied history. Borax, sulfur, and mercury are minerals that have been mined to a major extent. By 1872 more than 700 tons of borax had already been removed from Big Borax and Little Borax Lakes. Between 1871 and 1875, 2 million pounds of sulfur were strip mined from the eastern Clear Lake area. Mining of sulfur continued on a large scale during World Wars I and II. The first quicksilver deposit was discovered in 1860, and since that time more than 19,000 tons of mercury has been removed from the county. Minor deposits of low-grade gold and silver ores, lime, manganese, chromium, asbestos, and umbers and ochres for paint have been discovered and worked. Gravel, sand, and cinders are the main mining products mined in the county today. Geothermal well development is also a major endeavor.

Recreation and tourism have always been major sources of income in Lake County. A census taken in 1870 reported 2,959 residents and 5,963 tourists in the county. Tourists came to enjoy the scenery and the many mineral springs in the area. Mineral water, which was reputed to have medicinal qualities, was bottled and sent out of the county by wagon. Gradually, the bottled mineral water and the mineral springs resorts lost their popularity, and the resorts closed or changed over to modern vacation type resorts. Recreation and tourism in Lake County today are centered mainly around water sport activities on Clear Lake.

Physiography, Relief, and Drainage

Lake County is within the northern Coast Range province of California. In general, the Coast Range is composed of rugged hills and mountains and intervening valleys, with ridges trending to the northwest. It is highly dissected with perennial and intermittent streams. The pattern is the result of a complex sequence of geologic folds and faults.

Within the county, modification of the general physiographic province has taken place locally. The county can be divided into four generalized kinds of landscape: (1) broad valleys, low terraces, and rolling hills; (2) rugged mountains; (3) volcanic terrain; and (4) uplifted, dissected hills.

The broad valleys, low terraces, and rolling hills of the Clear Lake Basin occupy a structural depression in the Coast Range. The principal valleys of Big Valley, the area around Upper Lake, and the area around Middletown are filled with unconsolidated sediment, which in places is more than 500 feet thick. The valleys are surrounded by gently sloping to moderately steep hills. Several other smaller valleys are scattered throughout the county, some of which are at higher elevations. Internal soil drainage is very poor to somewhat poor in the soils that are in some of the depressional areas of the valleys. Associated with the valleys are relatively flat, dissected depositional terraces along the west shore of Clear Lake, near Lakeport; in areas of Big Valley; and near Upper Lake. Elevation ranges from 620 feet at Putah Creek, near the Napa County line, to about 2,800 feet, just north of Nice.

Rugged mountains are located in the northern part of the county, mainly in the Mendocino National Forest, and along the western edge of the county. Elevation ranges from about 1,360 feet at Blue Lakes to 7,050 feet on Snow Mountain.

Volcanic flows, lava domes, and ashfall cover about 85 square miles southwest, south, and east of the lower end of Clear Lake. Mount Konocti, a composite volcano, dominates the landscape. The Boggs Mountain area and some of the hills near Middletown are included in the volcanic field. Slopes are moderately steep to very steep. Elevation ranges from 1,326 feet at Clear Lake to 4,722 feet on Cobb Mountain.

East of the city of Clearlake Highlands is an area of gently sloping to very steep, uplifted, dissected hills and scarps that formed in poorly consolidated sediment of the Cache Formation. The area, which covers about 40 square miles, has been described as "semibadland" (*9*). Elevation ranges from about 1,000 feet at Grizzly Canyon to about 2,200 feet on Bald Mountain.

Three principle drainageways are within the county: (1) Clear Lake Basin, (2) Putah Creek, and (3) Eel River. The surface water carried by them is derived from direct precipitation and from spring flow. The volume of water carried reaches its peak in winter and spring and decreases substantially in summer. Creeks in the Clear Lake Basin include Adobe, Cole, Kelsey, Long Valley, North Fork Cache, Scotts, and Siegler Creeks. This water accumulates in Clear Lake and Indian Valley Reservoir and then continues southeasterly out of the county, by way of Cache Creek, into the Sacramento River. Harbin, Soda, and Putah Creeks form the Putah Creek drainageway. This water flows southeasterly out of the county to be discharged into Lake Berryessa, in Napa County. Most of the water in the northern part of the county accumulates in Eel River, flows into Lake Pillsbury, and then continues to the Pacific Ocean, near Eureka in Humboldt County.

Climate

Jerry L. Hatfield, biometeorologist, University of California, Davis, helped to prepare this section.

The climate of Lake County is characterized by warm, dry summers and cool, moist winters. The influence of the Pacific Ocean, which is modified by the distance from the coast and by the intervening mountains, is a major factor. In summer, the influence of a continual tropical airmass results in high daytime temperatures and moderate nighttime cooling. In winter, the presence of a marine airmass generally prevents temperatures from dropping below 20 degrees F. Winter storms periodically sweep in from the Pacific Ocean; however, clear sunny weather is common in winter.

The average annual temperature in the valley regions near Clear Lake is 56 degrees. There is about a 30-degree difference between the average temperatures of the warmest and coldest months. Climatic data are not available for the upland regions, but it is estimated from data collected at nearby areas that the average annual temperature in the forested mountains is about 53 degrees at 3,000 feet elevation and about 47 degrees at 5,000 feet elevation. Table 1 gives the average monthly temperature and precipitation recorded at Lakeport over a 25-year period.

In winter, the average temperature at Lakeport is 44 degrees and the average daily minimum temperature is 33 degrees. The lowest temperature at this location, recorded in 1972, is 9 degrees. In summer, the average temperature at Lakeport is 71 degrees and the average daily maximum temperature is 91 degrees. The highest recorded temperature at this location, recorded in 1972, is 112 degrees.

The average number of growing-degree-days at Lakeport is 3,716. Growing-degree-days are equivalent to "heat units." During the month, growing-degree-days accumulate by the amount that the average temperature each day exceeds a base temperature (65 degrees). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The growing season, which is the average number of days between the last freezing temperature in spring and the first in fall, ranges from 150 to 210 days in the valley regions around Clear Lake. The last freeze in spring commonly occurs from the last week of April to the middle of May, and the first freeze in fall commonly occurs from the middle of October to the middle of November. The variability in the length of the growing season in the valley regions reflects variation in air-drainage patterns, a function of the surrounding topography.

The average date of the last freeze in spring is April 30 at Clearlake Highlands, May 7 at Lake Pillsbury, April 28 at Lakeport, and May 13 at Upper Lake Ranger Station. The average date of the first freeze in fall is October 16 at Clearlake Highlands, October 14 at Lake Pillsbury, October 30 at Lakeport, and October 9 at Upper Lake Ranger Station. The average length of the growing season is 165 days at Clearlake Highlands, 160 days at Lake Pillsbury, 183 days at Lakeport, and 149 days at Upper Lake Ranger Station.

Table 2 gives the probability of freezes at various times in spring and fall at Lakeport.

The average annual precipitation in Lake County ranges from 24 inches in the valley regions to 70 inches or more in the mountains. Figure 1 shows precipitation patterns for the entire county. The average annual precipitation at Lakeport is 30 inches. The largest recorded daily rainfall at this location was 5.4 inches in December 1937. Table 3 gives the probability of receiving varying amounts of rainfall at Lakeport and Middletown. Table 4 gives the frequency of occurrence of rainstorms of varying duration at Lakeport (*38*).

Snowfall is rare at the lower elevations. The average annual snowfall at Lakeport is 0.5 inch. Significant snowfall does occur at the higher elevations in the mountains. The average seasonal snowfall at Hullville, elevation 2,250 feet, is 26 inches.

Relative humidity at Lakeport averages about 80 percent in winter and about 30 percent in summer and early in fall. The evaporation rate is high in summer because of high temperatures and low humidity. Annual evaporation at Lakeport is 65 inches, of which about 70 percent occurs in May to October. There is enough heat energy available that a growing crop might use 23.5 inches of moisture. Without irrigation, however, the annual precipitation distribution limits the crop to the use of 7.6 inches.

Vegetation

The major vegetation types supported by the soils in Lake County are brush, conifer and hardwood forest, oak-grass, annual grass, and freshwater marsh. These vegetation types occur in complexes of varying percentage and acreage, and within each group there are many intergrades. About 5 percent of the acreage in the county, mostly in and around the valley areas, is cultivated for crops and pasture. About 1 percent of the area is Urban land.

Soils that support brush, or chaparral, cover about 40 percent of the survey area. Wildfires and associated soil erosion are common in these areas and have an influence on plant composition. Brush grows at all elevations in the county. The soils commonly are shallow, are coarse- or medium-textured, and have low available water capacity. Examples are the Etsel, Maymen, and Snook soils. At the warm, low elevations, some deeper, finer textured soils on south- and west-facing slopes support brush. Examples are the Arrowhead, Bally, and Benridge soils. At higher elevations, more than 3,500 feet, brush commonly grows only on shallow soils on south- and west-facing slopes. Soils that formed in material weathered from serpentinitic rock, such as Henneke, Montara, and Okiota soils, also support brush. Chamise, manzanita, ceanothus, scrub oak, and toyon are common plants. Scattered McNab cypress grows in some areas of soils that formed in serpentinitic parent material.

Conifer and hardwood forest cover about 35 percent of the survey area, mainly in the Mendocino National Forest, the Boggs Mountain area, and the Mount St. Helena area. Ponderosa pine, Douglas-fir, California black oak, Pacific madrone, and canyon live oak are common tree species. Aiken, Collayomi, Kekawaka, Neuns, and Sanhedrin soils are examples of soils that support these trees. Tanoak grows on Forward Variant soils in an area of high rainfall near Mount St. Helena. White fir, red fir, and Jeffery pine grow on Freezeout soils at elevations above 5,000 feet in the Mendocino National Forest. On some soils, commonly at elevations below 3,000 feet, on north- and east-facing slopes and commonly surrounded by brush, are small areas of hardwood forest. Canyon live oak, California black oak, Pacific madrone, and California-laurel are the dominant trees in these areas, and they grow on soils such as those of the Hopland and Mayacama series. Knobcone pine is common in areas of soils that commonly support conifers and hardwoods but that have a history of wildfires.

Soils that support forage make up about 18 percent of the county. The vegetation types on these soils are oak-grass and annual grass.

Blue oak is the dominant tree in oak-grassland areas, although interior live oak and digger pine also grow in these areas. Bressa, Millsholm, Skyhigh, and Sobrante soils are examples of soils that support this vegetation type. These soils commonly support a 10- to 50-percent canopy cover of oak. The canopy is highly variable, but it commonly is heavier on north-facing slopes. In many areas the trees have been thinned or cleared to increase forage production. Soft chess, wild oat, and scattered forbs are in the understory. Oak-grass vegetation grows mostly at the warm, low to intermediate elevations, but it

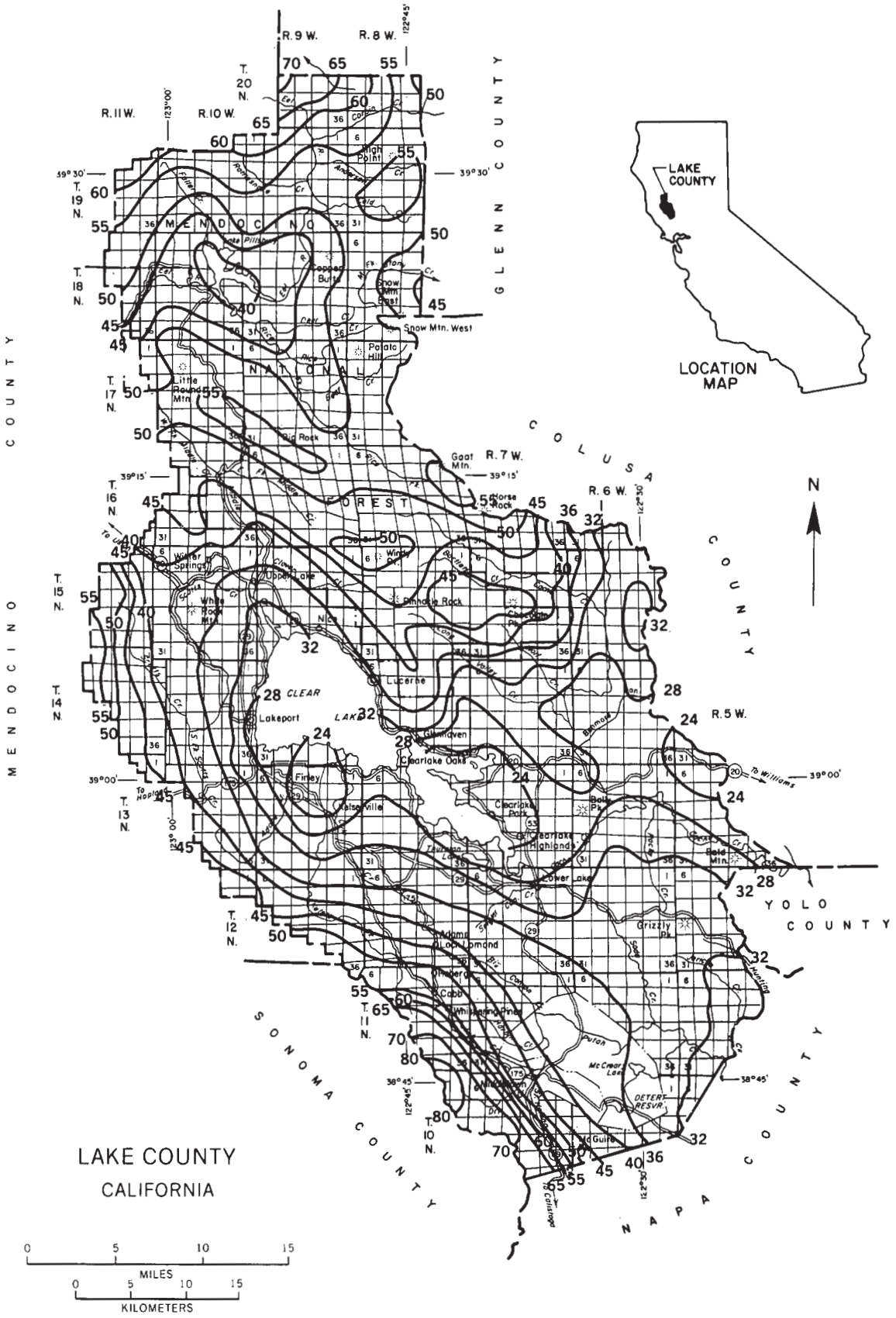

Figure 1.—Isohyetal map showing general precipitation patterns.

also grows at elevations of as much as 4,500 feet on south- and west-facing slopes.

Annual grass vegetation in the county is typified by soft chess, wild oat, filaree, ripgut brome, and annual clover. In some areas are bunchgrasses, especially purple needlegrass. The species composition is highly variable and depends on the kind of soil and the land use history. Scattered oaks and brush are interspersed within many areas of annual grasses. Pomo, Squawrock, and Yorkville soils are examples of soils that support annual grasses.

Freshwater marsh covers less than 1 percent of the survey area, but it provides important habitat for wetland wildlife. Tules, rushes, carex, and cattails are common. Tulelake soils and Fluvaquentic Haploquolls support this vegetation type along the fringes of Clear Lake and in some depressional areas in the valley. Vegetation along stream channels is also important to some wildlife species. Cottonwood, willow, and elderberry are a few of the dominant plants in these areas.

Weeds are a problem in many cultivated areas and in some areas of overgrazed annual grasses. Starthistle, tarweed, fiddleneck, and puncturevine are some of the common weeds in the county.

Water Supply

Water in Lake County is used for agricultural and domestic consumption and for fire protection. It is also a key attraction to thousands of summertime visitors and is important to the abundant wildlife resources of the area. Agricultural use is for irrigation and protection of pears and grapes from frost; for irrigation of walnuts, some field and truck crops, and pasture; and for use by livestock.

Water sources include underground aquifers and surface water. Runoff from precipitation, including rainfall and some snowfall, replenishes these sources. Water for irrigation and frost protection is primarily from ground water sources, but some treated water from Clear Lake is also used. There are more than 99 registered domestic distribution systems in the county, of which 15 have 200 or more service connections. Springs, streams, shallow wells in pockets of alluvium, and small earthen dams that impound water are used throughout the foothill and mountain areas.

The principal ground water aquifers used by the population centers and agricultural areas are in the Big Valley, Collayomi, Scotts Valley, and Upper Lake ground water basins. The combined storage capacity of these basins is about 111,000 acre-feet, and the usable capacity is about 35,000 acre-feet. Several smaller ground water basins throughout the county are also used. Water quality generally is good to excellent, but a few areas have water that is high in content of boron, iron, or manganese, or all of these.

There are three major watershed areas in the county. The Clear Lake Basin watershed includes the Big Valley, Scotts Valley, and Upper Lake ground water basins. The largest body of surface water in this watershed is Clear Lake, which has an area of 43,800 acres. The lake is operated by the Yolo County Flood Control and Water Conservation District, which delivers water to Yolo County to be used primarily for irrigation. Some communities around the lake use the water for domestic supply through riparian water rights or by purchasing it from Yolo County. Indian Valley Reservoir, 3,800 acres, is another major surface water body in the watershed. Most of this water also flows to Yolo County to be used for irrigation. Highland Springs Reservoir, 146 acres, and Adobe Creek Reservoir, 70 acres, provide flood control and ground water recharge to the Big Valley area. Several other creeks and small lakes throughout the county provide additional surface water.

The Upper Putah Creek watershed contains the Collayomi ground water basin. Four creeks, four small reservoirs, and one small lake are the major sources of surface water. These supply water for livestock and for existing agricultural development.

Lake Pillsbury, 2,280 acres, behind Scott Dam, is the major surface water body in the Upper Eel River watershed. It is owned by Pacific Gas and Electric Company and is used to control flow of the Eel River to the Potter Valley Power House in Mendocino County. At the present time no extensive consumptive use of this water is made in the county.

Ground water recharge occurs through seepage and underflow from creek channels, reservoirs, and lakes, rainfall percolation, and irrigation return flow. At present most of the ground water basins seem to recover by the end of the rainy season; however, the Big Valley and Scotts Valley basins have shown some signs of deterioration. During seasonal periods of low rainfall, ground water recharge cannot keep up with the demand for pumping and overdraft can occur. Land subsidence and reduction in ground water storage area have been observed in Scotts Valley, and therefore some wells are being drilled deeper in Big Valley. Recharge capacity, as well as flood protection, can be improved by the implementation of flashboard dams, stream channel improvement, conservative extraction of gravel from stream channels, and the construction of additional reservoirs.

Farming in the county is becoming more water intensive because of increased cultivation of crops that require irrigation and protection from frost. Development opportunities and an increasing number of tourists may also increase the demand for domestic consumption. Careful attention to the ground water situation and water conservation and possible development of outside water sources will ensure an adequate water supply for future use.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biologic activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind or segment of the landscape. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landscape, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with considerable accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Individual soils on the landscape commonly merge gradually onto one another as their characteristics gradually change. To construct an accurate map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted color, texture, size, and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While the soil survey was in progress, samples of some of the soils in the area were collected for laboratory analyses and for engineering tests. Soil scientists interpreted the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils were field tested through observation of the soils in different uses and under different levels of management. Some interpretations were modified to fit local conditions, and some new interpretations were developed to meet local needs. Data were assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management were assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can state with a fairly high degree of probability that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

General Soil Map Units

The general soil map at the back of this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, a map unit consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The soils or miscellaneous areas making up one unit can occur in other units but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils or miscellaneous areas can be identified on the map. Likewise, areas that are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

The general map units in this survey have been grouped into general kinds of landscape for broad interpretive purposes. Each of the broad groups and the map units in each group are described in the following pages. Acreages given in this section do not include water areas.

Map Unit Descriptions

Nearly level to strongly sloping soils in valleys and basins

The soils in this group are in the lower positions on the landscape. Slopes range from 0 to 8 percent but are dominantly less than 5 percent. Elevation ranges from about 620 feet along Putah Creek to about 2,800 feet in Mendocino National Forest. The average annual precipitation is 24 to 50 inches, and the average annual temperature is 54 to 59 degrees F. The frost-free season is 150 to 210 days.

These soils are very deep and are very poorly drained to somewhat excessively drained. They formed in alluvium derived from mixed sources. Vegetation in areas not cultivated is mainly annual grasses and forbs and scattered oaks. Water-tolerant plants grow in marsh areas.

This group is used mainly for irrigated field crops, hay and pasture, and livestock grazing. It is also used for homesite development and wildlife habitat.

Five map units are in this group. They make up about 7 percent of the survey area.

1. Tulelake-Fluvaquentic Haplaquolls

Very deep, nearly level, very poorly drained and poorly drained silty clay loam; in lake basins and marshes

This map unit occurs in marsh and reclaimed marsh areas around Clear Lake, mostly near Anderson Marsh, Rodman Slough, Tule Lake, and the north end of Big Valley. Some areas have been drained and protected from flooding. Vegetation in undrained areas is mainly marsh grasses, tules, rushes, and other water-tolerant plants.

This unit makes up about 1 percent of the survey area.

Tulelake soils are poorly drained. Typically, the profile is silty clay loam over stratified silty clay loam and silty clay. The water table fluctuates between 36 inches above the surface and 36 inches below the surface in winter.

Fluvaquentic Haplaquolls are very poorly drained. In a reference profile, these soils are silty clay loam over stratified loamy coarse sand, silty clay loam, and loam. The water table fluctuates between 12 inches above the surface and 36 inches below the surface annually.

Of minor extent in this unit are very deep Landlow Variant, Lupoyoma, and Clear Lake soils.

This unit is used mainly as wetland wildlife habitat. Areas that are drained and protected are used for hay and pasture and a few specialty crops.

2. Cole-Clear Lake Variant-Clear Lake

Very deep, nearly level, poorly drained clay loam and clay; in basins

This map unit occurs mainly in Big Valley and the Upper Lake vicinity. Soil drainage has been altered in many areas because of the entrenchment of stream channels. Most areas are cultivated. Vegetation in areas not cultivated is mainly annual grasses and oaks.

This unit makes up about 1 percent of the survey area.

Cole soils typically are clay loam to a depth of 71 inches or more.

Clear Lake Variant soils typically are clay to a depth of 63 inches or more.

Clear Lake soils typically are clay to a depth of 72 inches or more.

Of minor extent in this unit are very deep, moderately well drained Cole Variant soils and Xerofluvents.

This unit is used mainly for irrigated field crops and hay and pasture.

3. Still-Lupoyoma

Very deep, nearly level, moderately well drained and well drained loam and silt loam; on alluvial plains and flood plains

This map unit is in bottom land areas throughout the county. Most areas are cultivated. Vegetation in areas not cultivated is mainly annual grasses and oaks.

This unit makes up about 3 percent of the survey area.

Still soils are well drained. Typically, these soils are loam over somewhat stratified clay loam, loam, and extremely gravelly loamy coarse sand to a depth of 70 inches or more.

Lupoyoma soils are moderately well drained. Typically, these soils are silt loam to a depth of 84 inches or more.

Of minor extent in this unit are very deep, well drained Kelsey and Wolfcreek soils; very deep, moderately well drained Cole Variant and Kilaga Variant soils; very deep, well drained Mocho Variant and Maywood Variant soils; and moderately deep, well drained San Joaquin Variant soils.

This unit is used mainly for irrigated field crops and hay and pasture. It is also used for homesite development. Some of the most productive cropland in the county is in this unit.

4. Talmage-Xerofluvents-Riverwash

Very deep, nearly level to moderately sloping, somewhat excessively drained very gravelly sandy loam and very gravelly loamy sand, and Riverwash; on alluvial fans and flood plains

This map unit is in bottom land areas near streams and creeks throughout the county. Vegetation in areas not cultivated is mainly annual grasses and scattered oaks on the Talmage soils and Xerofluvents. Vegetation on Riverwash is sparse; some grasses and shrubs grow on the sandbars and streambanks.

This unit makes up about 1 percent of the survey area.

Talmage soils typically are very gravelly sandy loam over very gravelly loam to a depth of 69 inches or more.

A reference profile of Xerofluvents is very gravelly loamy sand over very gravelly coarse sand and gravelly coarse sand to a depth of 84 inches or more.

Riverwash consists of erratically stratified layers of water deposited sand, gravel, and cobbles.

Of minor extent in this unit are very deep Still, Kelsey, and Maywood Variant soils.

This unit is used mainly for hay and pasture and as wildlife habitat.

5. Maxwell-Yorkville Variant

Very deep, nearly level to strongly sloping, somewhat poorly drained and well drained clay loam; on valley and basin floors and rims

This map unit is adjacent to serpentinitic uplands, mainly in the southern part of the county. Vegetation is mainly annual grasses and forbs.

This unit makes up about 1 percent of the survey area.

Maxwell soils typically are clay loam over clay to a depth of 84 inches or more.

Yorkville Variant soils typically are clay loam over sandy clay loam and clay to a depth of 71 inches or more.

This unit is used mainly for hay and pasture.

Gently sloping to moderately steep soils on dissected alluvial terraces

The soils in this group are in the lower positions on the landscape. Slopes range from 2 to 25 percent. Elevation ranges from 1,350 to 1,650 feet. The average annual precipitation is 25 to 35 inches, and the average annual temperature is 55 to 59 degrees F. The frost-free season is 160 to 205 days.

These soils are very deep and are well drained and moderately well drained. They formed in old alluvium derived from mixed sources. Vegetation in areas not cultivated is mainly oaks, annual grasses, and shrubs.

This group is used mainly for crop production, homesite development, hay and pasture, and livestock grazing.

One map unit is in this group. It makes up about 1 percent of the survey area.

6. Manzanita-Wappo-Forbesville

Very deep, gently sloping to moderately steep, moderately well drained and well drained loam; on dissected alluvial terraces

This map unit is in parts of Big Valley and Scotts Valley and near Upper Lake. Much of the city of Lakeport is in this map unit. Vegetation in areas not cultivated is mainly oaks, annual grasses, and shrubs.

This unit makes up about 1 percent of the survey area.

Manzanita soils typically are loam over clay loam in the upper part. Below this is clay over gravelly clay to a depth of 76 inches or more.

Wappo soils typically are loam over clay in the upper part. Below this is clay loam to a depth of 63 inches or more.

Forbesville soils typically are loam over clay in the upper part. Below this is very gravelly clay to a depth of 70 inches or more.

Of minor extent in this unit are soils that have more than 35 percent rock fragments in the profile or are cooler, very deep Wappo Variant soils, and moderately deep Asbill soils.

This unit is used mainly for walnuts and wine grapes, homesite development, hay and pasture, and livestock grazing.

Moderately sloping to very steep soils on uplifted, dissected hills

The soils in this group are in intermediate positions on the landscape. Slope ranges from 2 to 75 percent. Elevation ranges from about 1,100 feet to 2,500 feet. The average annual precipitation is 25 to 35 inches, and the average annual temperature is 55 to 59 degrees F. The frost-free season is 160 to 200 days.

These soils are very deep and well drained. They formed in semiconsolidated uplifted sediment of the Cache Formation. Vegetation is dominantly brush, oak, and annual grasses.

These soils are used mainly for livestock grazing, wildlife habitat, and watershed.

One map unit is in this group. It makes up about 4 percent of the survey area.

7. Phipps-Bally

Very deep, gently sloping to very steep, well drained loam and gravelly sandy clay loam; on uplifted, dissected hills

This map unit occupies an area east of Clearlake Oaks and Clearlake Highlands. Vegetation is mainly brush, oaks, and annual grasses.

This unit makes up about 4 percent of the survey area.

Phipps soils typically are loam over gravelly clay loam in the upper part. Below this is gravelly sandy clay loam over very gravelly sandy clay loam. Depth to semiconsolidated sediment is 75 inches or more.

Bally soils typically are gravelly sandy clay loam over very gravelly sandy clay loam in the upper part. The lower part is very gravelly sandy clay. Depth to semiconsolidated sediment is 65 inches or more.

Of minor extent in this unit are soils that have less clay in the profile than do the major soils, very deep Forbesville soils, moderately deep Asbill soils, and Badland.

This map unit is used mainly for livestock grazing, wildlife habitat, and watershed.

Moderately sloping to very steep soils on hills and mountains

The soils in this group are dominantly on the intermediate and upper positions on the landscape. Slope ranges from 5 to 75 percent. Elevation ranges from about 640 feet in the southern part of the county to 7,050 feet on Snow Mountain. The average annual precipitation is 25 to 70 inches, and the average annual temperature is 43 to 60 degrees F. The frost-free season is 90 to 205 days.

The soils are shallow to very deep and are well drained to excessively drained. They formed in residuum derived from sedimentary, metasedimentary, or serpentinitic rock. Vegetation is mainly annual grasses and oak or brush on hills and at the lower elevations of the mountains and is conifer forest at the intermediate and upper elevations of the mountains.

This group is used mainly for livestock grazing, timber production, wildlife habitat, and watershed. It is also used for homesite development and recreation.

Six map units are in this group. They make up about 77 percent of the survey area.

8. Millsholm-Skyhigh-Bressa

Shallow and moderately deep, moderately sloping to steep, well drained loam; on hills

This map unit is mainly in the Clear Lake Basin and in the southern and eastern parts of the county. Small areas occur as glades in the Mendocino National Forest. The soils in this unit formed in material derived mainly from sandstone and shale. Vegetation is mainly annual grasses, forbs, and oak. Elevation ranges from 640 to 4,000 feet. The average annual precipitation is 25 to 60 inches, and the average annual temperature is 54 to 60 degrees F.

This unit makes up about 14 percent of the survey area.

Millsholm soils are shallow. Typically, the profile is loam over clay loam. Fractured sandstone is at a depth of 18 inches.

Skyhigh soils are moderately deep. Typically, the soils are loam in the upper part and clay loam over clay in the lower part. Fractured sandstone is at a depth of 38 inches.

Bressa soils are moderately deep. Typically, the soils are loam over clay loam. Soft, fractured sandstone is at a depth of 26 inches.

Of minor extent in this unit are deep and very deep Sleeper soils; deep Yorkville, Pomo, and Yorktree soils; shallow Maymen soils; and moderately deep Asbill, Squawrock, Hopland, and Shortyork Variant soils. Some of the minor soils in this unit are at elevations of as much as 4,500 feet, in the Mendocino National Forest, where the average annual precipitation is higher and the average annual temperature is lower than those of the major soils of this unit.

This unit is used mainly for livestock grazing, wildlife habitat, and homesite development.

9. Henneke-Okiota-Montara

Shallow, moderately sloping to steep, well drained and somewhat excessively drained very gravelly loam and clay loam; on hills and mountains

This map unit is in scattered areas throughout the survey area, but the largest areas are in the southern and eastern parts. The soils formed in material derived mainly from serpentinite and peridotite. Vegetation is

mainly brush. Elevation ranges from 900 to 3,500 feet. The average annual precipitation is 25 to 45 inches, and the average annual temperature is 55 to 60 degrees F.

This unit makes up about 6 percent of the survey area.

Henneke soils are shallow and somewhat excessively drained. Typically, the soils are gravelly loam in the upper part and gravelly clay loam over very gravelly clay in the lower part. Fractured serpentinite is at a depth of 19 inches.

Okiota soils are shallow and well drained. Typically, the soils are very gravelly clay loam in the upper part and clay loam over clay in the lower part. Fractured serpentinite is at a depth of 14 inches.

Montara soils are shallow and well drained. Typically, the soils are clay loam throughout the profile. Fractured serpentinite is at a depth of 12 inches.

Of minor extent in this unit are areas of Rock outcrop, moderately deep Dubakella soils, and shallow Millsholm soils.

This map unit is used mainly for wildlife habitat and watershed. It is also used for homesite development.

10. Maymen-Etsel

Shallow, moderately sloping to very steep, somewhat excessively drained loam and gravelly loam; on hills and mountains

This map unit occurs throughout the survey area, mainly at the lower and intermediate elevations and on warm, dry, south-facing and west-facing slopes at the upper elevations. The soils in this unit formed in material derived mainly from sandstone. Vegetation is mainly brush with scattered hardwood trees at the lower and intermediate elevations and scattered coniferous trees at the upper elevations. Elevation ranges from 1,400 to 4,000 feet. The average annual precipitation is 30 to 60 inches, and the average annual temperature is 52 to 57 degrees F.

This unit makes up about 30 percent of the survey area.

Maymen soils are shallow. Typically, the soils are loamy throughout the profile. Sandstone is at a depth of 12 inches.

Etsel soils are shallow. Typically, the soils are gravelly loam over very gravelly loam. Sandstone is at a depth of 10 inches.

Of minor extent in this unit are moderately deep Mayacama soils; shallow Snook and Millsholm soils; moderately deep Speaker, Hopland, and Marpa soils; deep Sanhedrin soils; and Rock outcrop.

This unit is used mainly for wildlife habitat and watershed. It is also used for recreation and homesite development.

11. Sanhedrin-Speaker-Kekawaka

Moderately deep to very deep, moderately sloping to very steep, well drained loam and gravelly loam; on mountains

This map unit is mainly in the Mendocino National Forest, but some areas are in the Boggs Mountain area. The soils in this unit formed in material derived mainly from sandstone and shale. Vegetation is mainly conifer forest. Elevation ranges from 1,500 to 4,800 feet. The average annual precipitation is 30 to 60 inches, and the average annual temperature is 49 to 58 degrees F.

This unit makes up about 8 percent of the survey area.

Sanhedrin soils are deep. Typically, the soils are gravelly loam over gravelly clay loam. Hard sandstone is at a depth of 57 inches.

Speaker soils are moderately deep. Typically, the soils are gravelly loam over clay loam. Soft sandstone is at a depth of 27 inches.

Kekawaka soils are very deep. Typically, the soils are loam in the upper part and clay loam over clay in the lower part. Soft sandstone is at a depth of more than 70 inches.

Of minor extent in this unit are moderately deep Marpa and Neuns soils, very deep Bamtush soils, shallow Speaker Variant soils on ridgetops, very deep Jafa soils, and shallow Maymen soils on south-facing slopes.

This unit is used mainly for timber production, wildlife habitat, and watershed. Some of the most productive timber land in the county is in this unit.

12. Neuns-Deadwood-Sheetiron

Shallow and moderately deep, moderately steep to very steep, well drained and somewhat excessively drained gravelly loam and very gravelly sandy loam; on mountains

This map unit is mainly in the Mendocino National Forest, but some areas are in the Boggs Mountain area; Sheetiron soils occur mainly in the northeast corner of the survey area. The soils in this unit formed in material derived mainly from metasedimentary sandstone and mica-quartz schist. Vegetation is mainly conifer forest with scattered areas of hardwood trees and brush. Elevation ranges from 2,200 to 5,200 feet. The average annual precipitation is 40 to 60 inches, and the average annual temperature is 47 to 55 degrees F.

This unit makes up about 17 percent of the survey area.

Neuns soils are moderately deep and well drained. Typically, the soils are gravelly loam over very gravelly loam. Hard sandstone is at a depth of 31 inches.

Deadwood soils are shallow and somewhat excessively drained. Typically, the soils are very gravelly sandy loam over extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Sheetiron soils are moderately deep and well drained. Typically, the soils are gravelly loam in the upper part and very gravelly loam over extremely gravelly loam in the lower part. Fractured mica-quartz schist is at a depth of 29 inches.

Of minor extent in this unit are deep Sanhedrin soils; very deep Bamtush soils; moderately deep Speaker, Decy, Tyson, and Marpa soils; shallow Maymen soils; and Rock outcrop.

This map unit is used mainly for timber production, wildlife habitat, and watershed.

13. Freezeout-Yollabolly

Shallow and moderately deep, steep and very steep, well drained and excessively drained very gravelly sandy loam; on mountaintops

This map unit is mainly in the Mendocino National Forest, on Goat, Hull, and Snow Mountains. The soils in this unit formed in material derived mainly from metasedimentary sandstone. Vegetation is adapted to the cold climate and is mainly conifer forest consisting of white fir on the Freezeout soils and brush on the Yollabolly soils. Elevation ranges from 5,000 to 7,050 feet. The average annual precipitation is 50 to 70 inches, most of which occurs as snowfall, and the average annual temperature is 43 to 48 degrees F.

This unit makes up about 2 percent of the survey area.

Freezeout soils are moderately deep and well drained. Typically, the soils are very gravelly sandy loam over extremely gravelly sandy loam. Hard sandstone is at a depth of 25 inches.

Yollabolly soils are shallow and excessively drained. Typically, the soils are very gravelly sandy loam over extremely gravelly loam. Hard sandstone is at a depth of 14 inches.

Of minor extent in this unit are areas of Rock outcrop; areas of debris slopes that are devoid of vegetation; and Deadwood, Neuns, and Bamtush soils at the lower elevations.

This unit is used mainly for recreation, wildlife habitat, and timber production. Among the recreational uses are hiking and bridle paths and hunting.

Gently sloping to very steep soils on volcanic hills and mountains

The soils in this group are in the intermediate and upper positions on the landscape, in the Clear Lake volcanic field. Slope ranges from 2 to 75 percent. Elevation ranges from about 800 feet south of Middletown to 4,600 feet at Cobb Mountain. The average annual precipitation is 25 to 65 inches, and the average annual temperature is 50 to 60 degrees F. The frost-free season is 120 to 205 days.

These soils are shallow to very deep and are well drained. They formed in material derived dominantly from extrusive basic igneous rock. Vegetation is dominantly brush on the hills and at the lower and intermediate positions on the mountains and is conifer forest on the upper positions.

This group is used mainly for timber production, livestock grazing, wildlife habitat, and watershed. It is also used for dryland crop production, firewood production, and homesite development. Geothermal wells are being developed in some areas.

Four map units are in this group. They make up about 11 percent of the survey area.

14. Glenview-Bottlerock-Arrowhead

Moderately deep and very deep, gently sloping to steep, well drained very gravelly loam, extremely gravelly loam, and extremely gravelly sandy loam; on obsidian hills

This map unit occurs east of Mount Konocti, in the Red Hills and Camelback Ridge areas. The soils in this unit formed in material derived mainly from obsidian. Vegetation is dominantly brush with some scattered areas of conifers. Some areas have been cleared and cultivated. Elevation ranges from 1,500 to 3,000 feet. The average annual precipitation is 30 to 50 inches, and the average annual temperature is 53 to 59 degrees F.

This map unit makes up about 1 percent of the survey area.

Glenview soils are very deep. Typically, the soils are very gravelly loam over gravelly loam in the upper part and gravelly clay loam over clay in the lower part. Fractured obsidian is at a depth of more than 65 inches.

Bottlerock soils are very deep. Typically, the soils are extremely gravelly loam over very gravelly loam in the upper part and very gravelly clay loam over very gravelly clay in the lower part. Fractured obsidian is at a depth of more than 63 inches.

Arrowhead soils are moderately deep. Typically, the soils are extremely gravelly sandy loam over gravelly sandy loam in the upper part and gravelly sandy clay loam over extremely stony clay in the lower part. Fractured obsidian is at a depth of 31 inches.

Of minor extent in this unit are soils that are similar to the major soils but that are on south-facing slopes and have a warmer average annual temperature.

This map unit is used mainly as wildlife habitat and watershed. Cleared areas are used for cultivated crops. They can be used for timber production.

15. Sobrante-Guenoc-Hambright

Shallow and moderately deep, gently sloping to very steep, well drained loam, clay loam, and very gravelly loam; on basalt hills

This map unit is mainly in the southern part of the county, near Middletown and the Spruce Grove Road area. The soils in this unit formed in material derived mainly from olivine basalt. Vegetation is mainly annual grasses and forbs, oaks, and brush with some small areas of conifers. Elevation ranges from 800 to 3,500 feet. The average annual precipitation is 25 to 50 inches, and the average annual temperature is 50 to 60 degrees F.

This unit makes up about 3 percent of the survey area.

Sobrante soils are moderately deep. Typically, the soils are loam over clay loam. Fractured olivine basalt is at a depth of 38 inches.

Guenoc soils are moderately deep. Typically, the soils are clay loam in the upper part and clay over gravelly clay in the lower part. Fractured olivine basalt is at a depth of 28 inches.

Hambright soils are shallow. Typically, the soils are very gravelly loam throughout the profile. Fractured olivine basalt is at a depth of 16 inches.

Of minor extent in this unit are very deep Neice soils, moderately deep Benridge Variant and Whispering soils, very deep Aiken and Collayomi soils, and shallow Stonyford soils.

This unit is used mainly for livestock grazing, wildlife habitat, watershed, and homesite development.

16. Konocti-Benridge

Moderately deep and very deep, gently sloping to very steep, well drained cobbly loam and loam; on andesite, basalt, and dacite hills and mountains

This map unit is mainly in the area around Mount Konocti and extending southeast toward Lower Lake. Another small area is northeast of Clearlake Oaks, near Round Mountain. The soils in this unit formed in material derived mainly from andesite, basalt, dacite, and pyroclastic material. Vegetation is mainly brush. Some areas have been cleared and cultivated. Elevation ranges from 1,000 to 4,300 feet. The average annual precipitation is 25 to 40 inches, and the average annual temperature is 53 to 60 degrees F.

This unit makes up about 4 percent of the survey area.

Konocti soils are moderately deep. Typically, the soils are cobbly loam over very stony loam. Fractured dacite is at a depth of 39 inches.

Benridge soils are very deep. Typically, the soils are loam in the upper part and gravelly clay loam over clay in the lower part. Breccia is at a depth of 68 inches.

Of minor extent in this unit are very deep Sodabay soils, shallow Hambright soils, deep Konocti Variant soils, very deep Oxalis Variant soils on alluvial flats, Vitrandepts, Rock outcrop, and Cinderland.

This unit is used mainly as wildlife habitat and watershed. It is also used for cultivated crops and homesite development.

17. Collayomi-Aiken-Whispering

Moderately deep and very deep, moderately sloping to very steep, well drained very gravelly loam and loam; on andesite, basalt, and dacite mountains

This map unit is mainly in the Boggs Mountain and Cobb Mountain areas. The soils in this unit formed in material derived mainly from andesite, basalt, dacite, and pyroclastic tuff. Vegetation is mainly conifer forest. Elevation ranges from 1,400 to 4,600 feet. The average annual precipitation is 35 to 65 inches, and the average annual temperature is 50 to 55 degrees F.

This unit makes up about 3 percent of the survey area.

Collayomi soils are very deep. Typically, the soils are very gravelly loam. Basalt is at a depth of more than 60 inches.

Aiken soils are very deep. Typically, the soils are loam in the upper part and clay loam over clay in the lower part. Basalt is at a depth of more than 75 inches.

Whispering soils are moderately deep. Typically, the soils are loam in the upper part and gravelly loam over very cobbly loam in the lower part. Fractured andesite is at a depth of 26 inches.

Of minor extent in this unit are shallow Kidd soils, very deep Forward Variant soils, and moderately deep Forward soils.

This unit is used mainly for timber production, wildlife habitat, and watershed. It is also used for homesite development and geothermal well development.

Broad Land Use Considerations

The soils in Lake County vary widely in their potential for major land uses. About 5 percent of the county is used for cultivated crops, mainly pears, walnuts, and wine grapes. The cropland is concentrated largely in general soil map units 2, 3, and 6. Some areas of units 1, 4, 5, and 14 are also used as cropland, mainly for dryland walnuts, specialty crops, and pasture. Seasonal flooding is a concern in units 1 and 2. Wetness caused by flooding and ponding of water is the major soil limitation, and it may result in damage to crops. Soil erosion is a serious concern in areas of unit 14 that are cultivated for crops. Measures are needed to minimize soil loss.

Map units 7, 9, 10, and 16 and parts of units 14 and 15 are dominated by brush and are used mainly as wildlife habitat and watershed. These areas make up about 40 percent of the county. Wildfire and associated soil erosion are major concerns in these areas. Small areas of soils in these map units have the potential to be converted from brush to grass. Plant production on the soils in unit 9 is limited because of inherent soil fertility problems.

About 35 percent of the county supports conifer and hardwood forests. Included within this forest land are areas that are favorable for commercial timber production and for hardwood production. Hardwood production in the county is mainly for use as fuelwood. Timber and hardwood production is high in map units 11, 12, and 17. Some areas of units 13 and 14 have moderate potential for timber production. Areas of units 6, 7, 8, and 15 can be used as a source of fuelwood. The use of heavy equipment is limited to the drier seasons on many of the soils. Steepness of slope, the hazard of soil erosion, shallow depth to bedrock, and a high content of rock fragments in the soil profile are

limitations encountered when harvesting timber and constructing roads on many of the soils in these units.

About 18 percent of the county supports vegetation suitable for livestock grazing. Map units 8 and 15 and parts of units 5, 6, and 7 have high potential for the production of annual grasses and forbs. Compaction by livestock when the soils are wet and the hazard of soil erosion on steep slopes are important limitations of the soils in these units.

Urban land occupies about 1 percent of the county and is concentrated largely on map units 3, 6, 8, 15, and 16. Units 3 and 6 have few limitations for urban uses; however, they are also used as valuable cropland. Areas of units 8, 15, and 16 are limited by steepness of slope and shallow soil depth, which restrict construction of building foundations and septic tank absorption fields. Soils on flood plains generally have low potential for urban development because of flooding. Steepness of slope, restricted soil depth, low soil strength, and high shrink-swell potential are limitations in some or all areas of these map units. Sites that are suitable for houses and small commercial buildings, however, generally are available in these areas if site-specific investigation and design are used.

The potential for recreational use ranges from low to high, depending on the intensity of the intended use and the properties of the soils. In many of the map units, hilly to very steep slopes limit the use of the soils for intensive recreational development such as playgrounds and camp areas; however, small areas suitable for intensive development may be available in map units that have low potential for recreational development. Most of the map units are suitable for extensive recreational uses such as hiking, horseback riding, fishing, and hunting for waterfowl and upland game.

All of the map units have potential for wildlife habitat. Especially important are areas of potential wetland wildlife habitat, which cover about 1 percent of the county. In the section "Wildlife Habitat," the habitat in the county is discussed as it occurs in the general soil map units.

Detailed Soil Map Units

The map units delineated on the detailed maps provided with this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses. More information on each map unit is given under "Use and Management of the Soils."

Various parts of the survey area were mapped at different levels of detail. The most detailed mapping was accomplished for cropland and urban areas in the valleys. Field procedures consisted of identifying each delineation by transversing or observation or by transecting. Soil boundaries were plotted by observation and aerial photograph interpretation and were verified at closely spaced intervals. Minimum size of delineations was about 10 acres.

The less detailed mapping was accomplished for rangeland and forestland in the hills and mountains. Field procedures consisted of identifying each delineation by transversing or observation or aerial photograph interpretation or by transecting. Boundaries were plotted by observation and by aerial photograph interpretation and were verified by some observations. Minimum size of delineations was about 40 acres.

A map unit delineation on a map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils or miscellaneous areas. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils and miscellaneous areas are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some "included" areas that belong to other taxonomic classes.

Most included soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, inclusions. They may or may not be mentioned in the map unit description. Other included soils and miscellaneous areas, however, have properties and behavior divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, inclusions. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The included areas of contrasting soils or miscellaneous areas are mentioned in the map unit descriptions. A few included areas may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of included areas in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into segments that have similar use and management requirements. The delineation of such landscape segments on the map provides sufficient information for the development of resource plans, but if intensive use of small areas is planned, onsite investigation to precisely define and locate the soils and miscellaneous areas is needed.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer or of the underlying layers, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer or of the underlying layers. They also can differ in slope, stoniness, salinity, wetness, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. The name of a soil phase commonly indicates a feature that affects use or management. For example, Tulelake silty clay loam, flooded, is one of two phases in the Tulelake series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes or associations.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Benridge-Konocti association, 15 to 30 percent slopes, is an example.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Riverwash is an example.

Table 5 gives the acreage and proportionate extent of each map unit. Other tables (see "Summary of Tables") give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

Map Unit Descriptions

101—Aiken-Sobrante association, 5 to 15 percent slopes. This map unit is on hills and mountains. The vegetation is mainly conifers and hardwoods on the Aiken soil and annual grasses and hardwoods on the Sobrante soil. Elevation is 1,400 to 2,400 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 150 to 180 days.

This unit is about 45 percent Aiken loam and 25 percent Sobrante loam. The Aiken soil is on north- and east-facing slopes, and the Sobrante soil is on south- and west-facing slopes.

Included in this unit are small areas of Collayomi, Guenoc, and Whispering soils, Aiken and Sobrante soils that have slopes of 15 to 30 percent, and soils that are similar to the Aiken soil but are less than 60 inches deep or do not have a clay subsoil. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Aiken soil is very deep and well drained. It formed in material weathered from basalt. Typically, the upper part of the surface layer is reddish brown loam 5 inches thick and the lower part is reddish brown clay loam 4 inches thick. The upper 11 inches of the subsoil is yellowish red clay loam, and the lower 54 inches is reddish yellow clay and cobbly clay.

Permeability of the Aiken soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for timber production, firewood production, wildlife habitat, and watershed. It is also used for orchards and homesite development.

Ponderosa pine and California black oak are the main tree species on the Aiken soil, and blue oak is the main species on the Sobrante soil. On the basis of a 100-year site curve, the mean site index is 117 for ponderosa pine on the Aiken soil. The potential annual production of ponderosa pine on the Aiken soil is 540 board feet per acre from a fully stocked stand of trees. Volumes of 9 cords of wood per acre have been measured on the Sobrante soil.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings on the Aiken soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine occurs periodically. Among the common forest understory plants are bedstraw, greenleaf manzanita, and poison-oak on the Aiken soil and soft chess, ripgut brome, and wild oat on the Sobrante soil.

The main crop grown on this unit, primarily on the Aiken soil, is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. The main limitations are the hazard of erosion and steepness of slope. Depth to bedrock is a major limitation of the Sobrante soil. Use of a cover crop between rows of trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for homesite development, the main limitations are depth to bedrock in the Sobrante soil and the moderately slow permeability and low load bearing capacity of the Aiken soil. If this unit is used for septic

tank absorption fields, the limitations of moderate depth of the Sobrante soil and moderately slow permeability of the Aiken soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the limited ability of the Aiken soil to support a load. If this soil is used for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

The Aiken soil is in capability unit IIIe-1 (5), nonirrigated, and the Sobrante soil is in capability unit IIIe-8 (15), nonirrigated.

102—Aiken-Sobrante association, 15 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly conifers and hardwoods on the Aiken soil and annual grasses and hardwoods on the Sobrante soil. Elevation is 1,400 to 2,400 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 150 to 180 days.

This unit is about 40 percent Aiken loam and 30 percent Sobrante loam. The Aiken soil is on north- and east-facing slopes, and the Sobrante soil is on south- and west-facing slopes.

Included in this unit are small areas of Collayomi, Guenoc, and Whispering soils. Also included are small areas of Aiken and Sobrante soils that have slopes of 5 to 15 percent and soils that are similar to the Aiken soil but are less than 60 inches deep or do not have a clay subsoil. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Aiken soil is very deep and well drained. It formed in material weathered from basalt. Typically, the upper part of the surface layer is reddish brown loam 5 inches thick and the lower part is reddish brown clay loam 4 inches thick. The upper 11 inches of the subsoil is yellowish red clay loam, and the lower 54 inches is reddish yellow clay and cobbly clay.

Permeability of the Aiken soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, firewood production, wildlife habitat, and watershed. It is also used for orchards.

Ponderosa pine and California black oak are the main tree species on the Aiken soil, and blue oak is the main species on the Sobrante soil. On the basis of a 100-year site curve, the mean site index is 117 for ponderosa pine on the Aiken soil. The potential annual production of ponderosa pine on the Aiken soil is 540 board feet per acre from a fully stocked stand of trees. Volumes of 9 cords of wood per acre have been measured on the Sobrante soil.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails are slippery when wet, and they may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings on the Aiken soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine occurs periodically. Among the common forest understory plants are bedstraw, greenleaf manzanita, and poison-oak on the Aiken soil and soft chess, ripgut brome, and wild oat on the Sobrante soil.

The main crop grown on this unit, primarily on the Aiken soil, is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. This unit is poorly suited to orchards. The main limitations are the hazard of erosion and steepness of slope. Depth to bedrock is a major limitation of the Sobrante soil. Use of a cover crop between rows of trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

The Aiken soil is in capability unit IVe-1 (5), nonirrigated, and the Sobrante soil is in capability unit IVe-1 (15), nonirrigated.

103—Asbill clay loam, 5 to 8 percent slopes. This moderately deep, well drained soil is on hills. It formed in material weathered from shale and siltstone. The vegetation is mainly annual grasses and scattered oaks. Elevation is 1,350 to 2,100 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is olive gray clay loam 13 inches thick. The underlying material to a depth of 39 inches is olive gray and light olive gray clay. Soft siltstone is at a depth of 39 inches.

Included in this unit are small areas of Kelsey soils in drainageways, Skyhigh soils, Wappo Variant soils on uplifted terraces, and soils that are clay loam or silty clay

loam that is less than 35 percent clay in some or all horizons. Also included are soils that are similar to this Asbill soil but are noncalcareous in some or all horizons and have a clay loam or silty clay loam subsoil that is less than 35 percent clay. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Asbill soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate. The soil is calcareous throughout. The shrink-swell potential is high.

This unit is used mainly for livestock grazing. It is also used for hay and pasture, vineyards, and homesite development. It can be used for firewood production.

The production of forage is limited by the susceptibility of the soil to compaction when moist. Grazing should be deferred when the surface layer is saturated. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. The characteristic plant community on this unit is mainly soft chess, wild oat, and annual forbs.

If this unit is used for hay and pasture, the main limitations are the hazard of erosion and slow permeability. Depth to rock and available water capacity also limit use of the shallower areas of this unit. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

This unit is poorly suited to vineyards. The main crop grown is wine grapes. Irrigation commonly is used for maximum production of this crop. Slow permeability, the hazard of erosion, and steepness of slope are the main limitations. Depth to bedrock is also a limitation. Because of the slow permeability of the soil in this unit, irrigation water needs to be applied slowly to minimize runoff. Use of a cover crop between rows of vines helps to control erosion and runoff. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for homesite development, the main limitations are depth to bedrock, slow permeability, high shrink-swell potential, and low load bearing capacity. If this unit is used for septic tank absorption fields, the limitations of moderate depth and slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil in this unit to support a load. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIe-5 (15), irrigated and nonirrigated.

104—Asbill clay loam, 8 to 15 percent slopes. This moderately deep, well drained soil is on hills. It formed in material weathered from shale or siltstone. The vegetation is mainly annual grasses and scattered oaks. Elevation is 1,350 to 2,100 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is olive gray clay loam 13 inches thick. The underlying material to a depth of 39 inches is olive gray and light olive gray clay. Soft siltstone is at a depth of 39 inches. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Skyhigh soils. Also included are small areas of soils that are less than 10 inches deep and soils, in drainageways, that have 20 to 40 percent gravel throughout. Also included are small areas of soils that are similar to this Asbill soil but are noncalcareous in some or all horizons or have a clay loam subsoil that is less than 35 percent clay. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Asbill soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The soil is calcareous. The shrink-swell potential is high.

This unit is used mainly for livestock grazing. It is also used for hay and pasture and for homesite development. It can be used for firewood production.

The production of forage is limited by the susceptibility of the soil to compaction when moist. Grazing should be deferred when the surface layer is saturated. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. The characteristic plant community on this unit is mainly soft chess, wild oat, and annual forbs.

If this unit is used for hay and pasture, the main limitations are the hazard of erosion and slow permeability. Depth and available water capacity also limit use of the shallower areas of this unit. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

If this unit is used for homesite development, the main limitations are depth to bedrock, slow permeability, high shrink-swell potential, and low load bearing capacity. If

this unit is used for septic tank absorption fields, the limitations of moderate depth and slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the effects of shrinking and swelling and the limited ability of the soil in this unit to support a load. The effects of shrinking and swelling can be minimized by using proper engineering designs and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIe-5 (15), irrigated and nonirrigated.

105—Badland. This map unit is in steep ravines and on barren dissected terrace escarpments. It formed in areas of semiconsolidated uplifted alluvial deposits derived from mixed rock sources. Active geologic erosion is extreme. Slopes are 50 to 100 percent. This unit commonly is barren; however, some areas support very sparse annual grasses or brush. Elevation is 1,100 to 2,000 feet.

Areas of this unit have severely eroded terrace slopes with "V"-shaped gullies or consist of recent slip faces on very steep or nearly vertical stream escarpments. Local relief generally ranges from 50 to 500 feet.

Included in this unit are small areas of Bally and Phipps soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Surface runoff is very rapid, and the hazard of erosion is severe. These actively eroding areas generally produce a high sediment yield to nearby streams.

Areas in which stability is a severe problem commonly are produced by stream channels that undercut the terrace slope. Suitable streambank protectors could be used where the cutting occurs to reduce the amount of sediment in the streams.

Revegetating these areas is difficult because of the extreme geologic erosion, steepness of slope, and the low fertility of the geologic material.

This map unit is in capability subclass VIIIe (15), nonirrigated.

106—Bally-Phipps gravelly loams, 2 to 8 percent slopes. This map unit is on uplifted, dissected hills. The vegetation is mainly brush. Elevation is 1,100 to 1,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Bally gravelly loam and 35 percent Phipps gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Talmage soils. Also included are small areas of soils that are similar to the Bally and Phipps soils but have less than 35 percent clay in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Bally soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is yellowish brown gravelly loam 16 inches thick. The subsoil is yellowish brown very gravelly clay loam 31 inches thick. The substratum to a depth of 80 inches or more is brown very gravelly clay loam.

Permeability of the Bally soil is slow. Available water capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is slight.

The Phipps soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown gravelly loam 3 inches thick. The upper 20 inches of the subsoil is brown and pale brown gravelly clay loam, and the lower 38 inches is light yellowish brown gravelly clay.

Permeability of the Phipps soil is slow. Available water capacity is 8.0 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is slight.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development. It can be used for livestock grazing.

If this unit is used for homesite development, the main limitation is slow permeability. If the soils are used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The production of forage is limited by the tendency of this unit to produce woody species. If shrubs are managed to create open areas, this unit can produce a good stand of desirable grasses and forbs. Woody species should be left in drainageways to reduce erosion and provide habitat for wildlife. The characteristic plant community on this unit is mainly chamise and ceanothus. Estimates of rangeland productivity have not been made for this unit.

This map unit is in capability unit IIIs-3 (15), nonirrigated.

107—Bally-Phipps complex, 15 to 30 percent slopes. This map unit is on uplifted, dissected hills. The vegetation is mainly brush. Elevation is 1,400 to 2,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 40 percent Bally gravelly sandy clay loam and 35 percent Phipps loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Forbesville soils. Also included are small areas of Bally and Phipps soils that have slopes of more than 30 percent or less than 15 percent, soils that have a very gravelly surface layer, and soils that have a thicker dark colored surface layer and are in areas that are less subject to erosion. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Bally soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is yellowish brown gravelly sandy clay loam 2 inches thick. The upper 8 inches of the subsoil is yellowish brown gravelly sandy clay loam, and the lower 27 inches is variegated brown and reddish yellow very gravelly sandy clay loam and very gravelly sandy clay. The substratum to a depth of 65 inches or more is variegated brown and reddish yellow very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam, loam, or gravelly loam.

Permeability of the Bally soil is slow. Available water capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more, but most roots do not penetrate to a depth of more than about 15 to 25 inches because of the clayey texture of the subsoil. Surface runoff is rapid, and the hazard of erosion is moderate.

The Phipps soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is dark brown loam 6 inches thick. The subsoil is brown gravelly clay loam about 15 inches thick. The substratum to a depth of 73 inches is brown and yellowish brown gravelly and very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam.

Permeability of the Phipps soil is slow. Available water capacity is 6.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It can also be used for livestock grazing.

The production of forage is limited by the tendency of this unit to produce shrubs. If the shrubs are managed to create open areas, this unit can produce a good stand of desirable grasses and forbs. Woody species should be left in the drainageways and in the steeper areas to reduce erosion and provide habitat for wildlife. This unit should be managed to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The characteristic plant community on this unit is mainly chamise and ceanothus. Estimates of rangeland productivity have not been made for this unit.

This unit is dissected by numerous drainageways. To provide for seasonal runoff, properly designed culverts should be installed where roads cross natural drainageways. Water bars help to control erosion on roads.

This map unit is in capability unit IVs-1 (15), nonirrigated.

108—Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes. This map unit is on uplifted, dissected hills. The vegetation is mainly brush. Active geologic erosion occurs throughout this unit. Elevation is 1,400 to 2,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 35 percent Bally gravelly sandy clay loam, 20 percent Phipps loam, and 20 percent Haploxeralfs. The Bally and Phipps soils have slopes of 30 to 50 percent, and the Haploxeralfs have slopes of 50 to 75 percent. Landslips and active geologic erosion occur on the steeper slopes.

Included in this unit are small areas of Forbesville soils. Also included are small areas of Bally and Phipps soils that have slopes of less than 30 percent, soils that have a thicker dark-colored surface layer and are in areas that are less subject to erosion, and soils that are similar to the Bally soil but have been severely eroded. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Bally soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is yellowish brown gravelly sandy clay loam 2 inches thick. The upper 8 inches of the subsoil is yellowish brown gravelly sandy clay loam, and the lower 27 inches is variegated brown and reddish yellow very gravelly sandy clay loam and very gravelly sandy clay. The substratum to a depth of 65 inches or more is variegated brown and reddish yellow very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam, loam, or gravelly loam.

Permeability of the Bally soil is slow. Available water capacity is 5 to 7 inches. Effective rooting depth is 60 inches or more, but most roots do not penetrate to a depth of more than about 15 to 25 inches because of the clayey texture of the subsoil. Surface runoff is very rapid, and the hazard of erosion is severe.

The Phipps soil is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam 6 inches thick. The subsoil is brown gravelly clay loam about 15 inches thick. The substratum to a depth of 60 inches or more is brown gravelly and very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam.

Permeability of the Phipps soil is slow. Available water capacity is 6.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

Haploxeralfs are moderately deep to very deep and are well drained and somewhat excessively drained. No single profile of these soils is typical, but one commonly observed in the survey area has a surface layer of brown gravelly loam 5 inches thick. The upper 5 inches of the subsoil is light yellowish brown gravelly loam, and the lower 13 inches is light brown and light yellowish brown very gravelly sandy clay loam. The substratum to a depth of 65 inches is yellowish brown very gravelly sandy loam.

Permeability of the Haploxeralfs is moderate to slow. Available water capacity is 2.5 to 10.0 inches. Geologic erosion is high on these soils.

This unit is used mainly as wildlife habitat and watershed. It can also be used for livestock grazing.

The production of forage is limited by the dominance of the brush species on this unit and by steepness of slope. Because of the instability of the soil, trees and brush should be retained on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire. Slope limits access by livestock and results in overgrazing of the less sloping areas. The characteristic plant community on this unit is mainly chamise and ceanothus. Estimates of rangeland productivity have not been made for this unit.

This unit is dissected by numerous drainageways. To provide for seasonal runoff, properly designed culverts should be installed where roads cross natural drainageways. Water bars help to control erosion on roads crossing contours.

The Bally soil is in capability subclass VIs (15), the Phipps soil is in capability subclass VIe (15), and the Haploxeralfs, loamy, are in capability subclass VIIs (15), nonirrigated.

109—Bamtush-Neuns gravelly loams, 15 to 30 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 45 to 60 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 40 percent Bamtush gravelly loam and 30 percent Neuns gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Sanhedrin soils. Also included are small areas of Marpa and Shortyork Variant soils, Rock outcrop, Bamtush and Neuns soils that have slopes of less than 15 percent, and soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Bamtush soil is very deep and well drained. It formed in material weathered from sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is brown very gravelly loam, and the lower 46 inches is strong brown very gravelly loam.

Permeability of the Bamtush soil is moderate. Available water capacity is 5.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1.5 inches thick. The surface layer is brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured metamorphosed sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on this unit. Among the trees of limited extent are sugar pine, Pacific madrone, interior live oak, and white fir. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 134 on the Bamtush soil and 113 on the Neuns soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 139 on the Bamtush soil and 106 on the Neuns soil. The potential annual production of ponderosa pine on the Bamtush soil is 830 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Neuns soil is 425 board feet per acre from a fully stocked stand of trees.

There are no major soil limitations for the harvesting of timber on this unit. Rock for construction of roads generally is available.

Seedling survival is a concern in the production and reforestation of timber on these soils. The droughtiness of the surface layer reduces the survival rate of seedlings, especially in areas of the Neuns soil on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by conifers periodically occurs.

Among the common forest understory plants are bedstraw, snowberry, gooseberry, poison-oak, and perennial fescue.

This map unit is in capability unit IVs-1 (5), nonirrigated.

110—Bamtush-Speaker-Sanhedrin gravelly loams, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 49 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 30 percent Bamtush gravelly loam, 25 percent Speaker gravelly loam, and 20 percent Sanhedrin gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Kekawaka, Marpa, and Neuns soils and Rock outcrop. Also included are small areas of Bamtush, Sanhedrin, and Speaker soils that have slopes of less than 30 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Bamtush soil is very deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 1 inch thick. The surface layer is brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is brown very gravelly loam, and the lower 46 inches is strong brown very gravelly loam.

Permeability of the Bamtush soil is moderate. Available water capacity is 5.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, California black oak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 139 on the Bamtush soil, 106 on the Speaker soil, and 116 on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 134 on the Bamtush soil, 107 on the Speaker soil, and 121 on the Sanhedrin soil. The potential annual production of ponderosa pine on the Bamtush soil is 830 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are sugar pine, canyon live oak, Oregon white oak, and white fir.

Some concerns for the harvesting of timber are steepness of slope, the hazard of erosion, and seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on this unit.

Plant competition is a concern in the reforestation and production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of conifer seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation by conifers frequently occurs.

Among the common forest understory plants are bedstraw, princes pine, brackenfern, and rose.

This map unit is in capability subclass VIs (5), nonirrigated.

111—Bamtush-Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 40 to 60 inches, the average annual air

temperature is 49 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 30 percent Bamtush gravelly loam, 30 percent Speaker gravelly loam, and 15 percent Sanhedrin gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Kekawaka, Marpa, and Neuns soils and Rock outcrop. Also included are small areas of Bamtush, Speaker, and Sanhedrin soils that have slopes of less than 50 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Bamtush soil is very deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 1 inch thick. The surface layer is brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is brown very gravelly loam, and the lower 46 inches is strong brown very gravelly loam.

Permeability of the Bamtush soil is moderate. Available water capacity is 5.0 to 7.5 inches. Effective rooting depth is more than 60 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs about 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, California black oak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 134 on the Bamtush soil, 107 on the Speaker soil, and 121 on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 139 on the Bamtush soil, 106 on the Speaker soil, and 116 on the Sanhedrin soil. The potential annual production of ponderosa pine on the Bamtush soil is 830 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are sugar pine, canyon live oak, Oregon white oak, and white fir.

The main limitations for the harvesting of timber are steepness of slope and the hazard of erosion. Cable yarding systems generally are used on this unit. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff.

Plant competition is a concern in the production and reforestation of timber on this unit. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of conifer seedlings. Reforestation can be accomplished by planting Douglas-fir, sugar pine, and ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs.

Among the common forest understory plants are bedstraw, perennial fescue, brackenfern, and rose.

This map unit is in capability subclass VIIs (5), nonirrigated.

112—Benridge-Konocti association, 15 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush on south- and east-facing slopes and brush with scattered hardwoods and conifers on north- and west-facing slopes. Elevation is 1,300 to 4,300 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 140 to 200 days.

This unit is about 40 percent Benridge loam, 20 percent Konocti cobbly loam, and 20 percent Konocti stony loam. The Konocti soils are on the upper part of side slopes, on ridgetops, and in ravines, and the Benridge soil is in the other areas of the unit.

Included in this unit are small areas of Konocti Variant soils and Rock outcrop and boulders 3 to 20 feet in diameter that are predominantly in areas of the Konocti

soils. Also included are small areas of Benridge and Konocti soils that have slopes of more than 30 percent or less than 15 percent; small areas of soils that are similar to the Benridge and Konocti soils but are cooler; soils that are similar to the Benridge soil but have a thinner surface layer because of erosion; and soils that have 35 to 55 percent rocks and stones throughout. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Benridge soil is very deep and well drained. It formed in material weathered from volcanic ash, breccia, or tuff. Typically, the surface layer is light brown loam 6 inches thick. The upper 57 inches of the subsoil is yellowish red gravelly clay loam, and the lower 5 inches is yellowish red clay. Weathered volcanic breccia is at a depth of 68 inches.

Permeability of the Benridge soil is moderately slow. Available water capacity is 6.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Konocti cobbly loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown cobbly loam 8 inches thick. The upper 8 inches of the subsoil is brown stony loam, and the lower 16 inches is light reddish brown very stony loam. The substratum to a depth of 39 inches is reddish yellow very stony loam. Slightly weathered dacite is at a depth of 39 inches.

Permeability of the Konocti cobbly loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Konocti stony loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown stony loam 4 inches thick. The upper 5 inches of the subsoil is brown stony loam, and the lower 19 inches is light reddish brown very stony clay loam. Slightly weathered dacite is at a depth of 28 inches.

Permeability of the Konocti stony loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development.

Woody shrubs are the most extensive plants on this unit. The characteristic vegetation is mainly manzanita, chamise, and California scrub oak with scattered areas of knobcone pine. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and the moderately slow permeability. Other limitations are the depth to bedrock in the Konocti soils and large stones in the Konocti stony loam. Extensive cutting and filling generally are required. Cut and fill slopes are susceptible to erosion. The risk of erosion is increased by leaving the soil surface exposed during site development. Preserving the existing vegetation and revegetating disturbed areas around construction sites helps to control erosion. Cuts needed to provide building sites on the Konocti soils can expose bedrock and large stones. Large stones in the Konocti stony loam may interfere with building site preparation. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitations of moderately slow permeability of the Benridge and Konocti soils and the moderate depth of the Konocti soils can be minimized by increasing the area of the absorption fields or by using a specially designed sewage disposal system.

The Benridge soil is in capability unit IVe-1 (15), nonirrigated. The Konocti soils are in capability unit IVs-1 (15), nonirrigated.

113—Benridge-Konocti association, 30 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush on south- and east-facing slopes and brush with scattered hardwoods and conifers on north- and west-facing slopes. Elevation is 1,300 to 4,300 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 140 to 200 days.

This unit is about 40 percent Benridge loam, 30 percent Konocti cobbly loam, and 15 percent Konocti stony loam. The Konocti soils are on the upper side slopes, on ridgetops, and in ravines, and the Benridge soil is in the other areas of the unit.

Included in this unit are small areas of Konocti Variant soils; Rock outcrop and stones 3 to 25 feet in diameter, mainly in areas of the Konocti soils; Benridge and Konocti soils that have slopes of more than 50 percent; and soils that are similar to the Benridge and Konocti soils but have soil temperatures lower than 59 degrees F. Also included are small areas of soils that are similar to the Konocti soils but have fewer rock fragments and small areas of soils that are similar to the Benridge soil but have 35 to 55 percent rock fragments throughout the profile. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Benridge soil is very deep and well drained. It formed in material weathered from volcanic ash, breccia, or tuff. Typically, the surface layer is light brown loam 6 inches thick. The upper 57 inches of the subsoil is yellowish red gravelly clay loam, and the lower 5 inches is yellowish red clay. Weathered volcanic breccia is at a depth of 68 inches.

Permeability of the Benridge soil is moderately slow. Available water capacity is 6.5 to 10.5 inches. Effective

rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

The Konocti cobbly loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown cobbly loam 8 inches thick. The upper 8 inches of the subsoil is brown stony loam, and the lower 16 inches is light reddish brown very stony loam. The substratum to a depth of 39 inches is reddish yellow very stony loam. Slightly weathered dacite is at a depth of 39 inches.

Permeability of the Konocti cobbly loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Konocti stony loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown stony loam 4 inches thick. The upper 5 inches of the subsoil is brown stony loam, and the lower 19 inches is light reddish brown very stony clay loam. Slightly weathered dacite is at a depth of 28 inches. In some areas the surface layer is very stony loam.

Permeability of the Konocti stony loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development.

Woody shrubs are the most extensive plants on this unit. The characteristic vegetation is mainly manzanita, chamise, and California scrub oak with scattered areas of knobcone pine. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and the moderately slow permeability. Other limitations are depth to bedrock in the Konocti soils and large stones in the Konocti stony loam. Preferred building sites are limited to knolls and the less sloping areas. Extensive cutting and filling generally are required to provide building sites. These cuts may expose bedrock and large stones on the Konocti soils. Large stones in the Konocti stony loam may interfere with building site preparation. Cut and fill slopes are susceptible to excessive erosion. The risk of erosion is increased by leaving the soil surface exposed during site development. Preserving the existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Slope is a major limitation for the installation of septic tank absorption fields. Absorption lines should be installed on the contour. If this unit is used for septic tank absorption fields, the limitations of moderate depth of the Konocti soils and moderately slow permeability of the Konocti and Benridge soils can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The Benridge soil is in capability subclass VIe (15), nonirrigated. The Konocti soils are in capability subclass VIs (15), nonirrigated.

114—Benridge-Sodabay loams, 8 to 15 percent slopes. This map unit is on hills. The vegetation is mainly brush with a few scattered oaks and conifers. Elevation is 1,350 to 1,450 feet. The average annual precipitation is 25 to 30 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Benridge loam and 40 percent Sodabay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Guenoc, Hambright, and Konocti soils. Also included are small areas of soils that are similar to the Benridge and Sodabay soils but are 40 to 60 inches deep to bedrock and Benridge and Sodabay soils that have slopes of 15 to 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Benridge soil is very deep and well drained. It formed in material weathered from dacite, breccia, or tuff. Typically, the surface layer is light brown loam 6 inches thick. The upper 57 inches of the subsoil is yellowish red gravelly clay loam, and the lower 5 inches is yellowish red clay. Weathered breccia is at a depth of 68 inches.

Permeability of the Benridge soil is moderately slow. Available water capacity is 6.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

The Sodabay soil is very deep and well drained. It formed in material weathered from dacite, tuff, breccia, or volcanic ash. Typically, the surface layer is light reddish brown loam 6 inches thick. The upper 46 inches of the subsoil is light reddish brown clay loam, and the lower 11 inches is light reddish brown gravelly clay loam. Weathered pyroclastic tuff is at a depth of 63 inches.

Permeability of the Sodabay soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used for homesite development, wildlife habitat, and watershed.

If this unit is used for homesite development, the main limitation is the moderately slow permeability of the soils. If this unit is used for septic tank absorption fields, the limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability unit IIIe-1 (5), nonirrigated.

115—Benridge-Sodabay loams, 15 to 30 percent slopes. This map unit is on hills. The vegetation is mainly brush with scattered oaks and conifers. Elevation is 1,400 to 2,200 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 155 to 200 days.

This unit is about 45 percent Benridge loam and 40 percent Sodabay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Hambright and Konocti soils. Also included are small areas of soils that are similar to the Benridge and Sodabay soils but are less than 60 inches deep or have slopes of less than 15 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Benridge soil is very deep and well drained. It formed in material weathered from volcanic ash, breccia, or tuff. Typically, the surface layer is light brown loam 6 inches thick. The upper 57 inches of the subsoil is yellowish red gravelly clay loam, and the lower 5 inches is yellowish red clay. Weathered breccia is at a depth of 68 inches. In some areas the surface layer is gravelly loam.

Permeability of the Benridge soil is moderately slow. Available water capacity is 6.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Sodabay soil is very deep and well drained. It formed in material weathered from dacite, tuff, breccia, or volcanic ash. Typically, the surface layer is light reddish brown loam 6 inches thick. The upper 46 inches of the subsoil is light reddish brown clay loam, and the lower 11 inches is light reddish brown gravelly clay loam. Weathered pyroclastic tuff is at a depth of 63 inches.

Permeability of the Sodabay soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for orchards and homesite development.

Woody shrubs are the most extensive plants on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The main crop grown on this unit is walnuts. The main limitations are the hazard of erosion and steepness of slope. Where brush is removed to create open areas, this unit can be used for orchards. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. Areas used for walnuts should be restricted to the less sloping areas. Use of cover crops between rows of trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, steepness of slope, and the hazard of erosion. If this unit is used for septic tank absorption fields, the limitation of moderately slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Extensive cutting and filling generally are required to provide roadbeds and building sites. Cut and fill slopes are susceptible to excessive erosion. The risk of erosion is increased if the soil surface is left exposed during construction. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour.

This map unit is in capability unit IVe-1 (15), nonirrigated.

116—Benridge Variant loam, 2 to 15 percent slopes. This moderately deep, well drained soil is on hillslopes at valley sides. It formed in material weathered from basaltic tuff. The vegetation is mainly oaks, brush, and annual grasses. Elevation is 1,100 to 2,000 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 55 to 60 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is reddish brown and light reddish brown loam 11 inches thick. The subsoil is pale yellow gravelly clay 13 inches thick. Weathered tuff is at a depth of 24 inches.

Included in this unit are small areas of Guenoc, Hambright, and Stonyford soils; soils that are less than 10 inches deep to basaltic tuff and are on ridgetops; and soils that are similar to this Benridge Variant soil but have slopes of 15 to 30 percent. Also included are small areas of soils that are similar to this Benridge Variant soil but have a stony surface, are 10 to 20 inches deep and do not have clay that has high shrink-swell potential in the subsoil, or are 40 to 60 inches deep over basaltic tuff. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Benridge Variant soil is very slow. Available water capacity is 2.0 to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential of the subsoil is high.

This unit is used mainly for livestock grazing. It is also used for homesite development. It can be used for firewood production.

The production of forage is limited by the restricted available water capacity. Where oaks and brush grow, forage production will be increased by managing harvesting of the trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 9 cords of wood per acre have been measured on this unit. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. The main limitations for seeding are the presence of some stony areas and the tendency of the unit to produce woody plants. Among the common understory plants are soft chess, filaree, and annual clover.

If this unit is used for homesite development, the main limitations are the depth to bedrock, the very slow permeability, and the high shrink-swell potential of the subsoil. If the unit is used for septic tank absorption fields, the limitation of very slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The high shrink-swell potential of the subsoil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be minimized by backfilling with a material that has low shrink-swell potential.

This map unit is in capability unit IVe-8 (15), nonirrigated.

117—Bottlerock-Glenview-Arrowhead complex, 5 to 30 percent slopes. This map unit is on volcanic hills. The vegetation is mainly brush with scattered conifers. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 150 to 195 days.

This unit is about 50 percent Bottlerock extremely gravelly loam, 20 percent Glenview very gravelly loam, and 15 percent Arrowhead extremely gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that are similar to the Arrowhead soil but are 10 to 20 inches deep over obsidian and small areas of soils that are similar to the Glenview soil but have 35 to 70 percent cobbles and stones throughout. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Bottlerock soil is very deep and well drained. It formed in material weathered from obsidian. Typically, the upper 5 inches of the surface layer is dark grayish brown extremely gravelly loam and commonly has a surface pavement that is 90 percent gravel, the next 4 inches is light gray very gravelly loam, and the lower 10 inches is very pale brown very gravelly loam. The upper 9 inches of the subsoil is very pale brown very gravelly sandy clay loam, the next 11 inches is light brown very gravelly clay loam, and the lower 24 inches is dark red, strong brown, and reddish yellow very gravelly clay.

Permeability of the Bottlerock soil is slow. Available water capacity is 2.5 to 6.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Glenview soil is very deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown very gravelly loam 1 inch thick and the lower part is brown gravelly loam 5 inches thick. The upper 9 inches of the subsoil is reddish yellow gravelly clay loam, the next 25 inches is reddish yellow gravelly clay, and the lower 25 inches is reddish yellow gravelly clay loam. In some areas the surface layer is very gravelly sandy loam.

Permeability of the Glenview soil is moderately slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Arrowhead soil is moderately deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown extremely gravelly sandy loam 1 inch thick and the lower part is brown gravelly sandy loam 3 inches thick. The upper 4 inches of the subsoil is brown gravelly sandy loam, the next 6 inches is light brown gravelly sandy clay loam, and the lower 17 inches is reddish yellow very stony clay. Hard, fractured obsidian is at a depth of 31 inches.

Permeability of the Arrowhead soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It can be used for production of timber and Christmas trees.

Proper site preparation on the Bottlerock and Glenview soils might make it possible to replace stands of brush and hardwoods with conifers. These soils are suited to the production of ponderosa pine. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 103 on the Bottlerock soil and 110 on the Glenview soil. The potential annual production of ponderosa pine on the Bottlerock soil is 400 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Glenview soil is 460 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for the Arrowhead soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber is the potential shredding effect of the obsidian on rubber tires. The soils in this unit also are subject to gullying when the surface layer is removed. Disturbance of this protective layer can be reduced by the careful use of wheeled and tracked equipment. Establishing plant cover on steep cut

and fill slopes reduces erosion on the Glenview soil; however, revegetation of cut and fill slopes is difficult on the Bottlerock and Arrowhead soils because of the restricted available water capacity and the high content of rock fragments.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished on the Bottlerock and Glenview soils by planting large ponderosa pine seedlings following proper site preparation. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Planting on the Arrowhead soil is not practical because of the restricted available water capacity. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are blueblossom ceanothus, interior live oak, and manzanita.

This map unit is in capability unit IVs-1 (5), nonirrigated.

118—Bottlerock-Glenview-Arrowhead complex, 30 to 50 percent slopes. This map unit is on volcanic hills. The vegetation is mainly brush with scattered conifers. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 150 to 195 days.

This unit is about 40 percent Bottlerock extremely gravelly loam, 20 percent Glenview very gravelly loam, and 15 percent Arrowhead extremely gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that are similar to the Arrowhead soil but are 10 to 20 inches deep over obsidian and small areas of Arrowhead, Bottlerock, and Glenview soils that have slopes of more than 50 percent. Also included are small areas of soils that are similar to the Glenview soil but have 40 to 75 percent stones and cobbles throughout and small areas of soils that are similar to the Bottlerock, Glenview, and Arrowhead soils but are severely eroded. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Bottlerock soil is very deep and well drained and commonly has a surface pavement that is 90 percent gravel. It formed in material weathered from obsidian. Typically, the upper 5 inches of the surface layer is dark grayish brown extremely gravelly loam, the next 4 inches is light gray and very pale brown very gravelly loam, and the lower 10 inches is very pale brown very gravelly loam 10 inches thick. The upper 9 inches of the subsoil is very pale brown very gravelly sandy clay loam, the next 11 inches is light brown very gravelly clay loam, and the lower 24 inches is strong brown and reddish yellow very gravelly clay.

Permeability of the Bottlerock soil is slow. Available water capacity is 2.5 to 6.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Glenview soil is very deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown very gravelly loam 1 inch thick and the lower part is brown gravelly loam 5 inches thick. The upper 9 inches of the subsoil is reddish yellow clay loam, the next 25 inches is reddish yellow gravelly clay, and the lower 25 inches is reddish yellow gravelly clay loam. In some areas the surface layer is very gravelly sandy loam.

Permeability of the Glenview soil is moderately slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Arrowhead soil is moderately deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown extremely gravelly sandy loam 1 inch thick and the lower part is brown gravelly sandy loam 3 inches thick. The upper 4 inches of the subsoil is brown gravelly sandy loam, the next 6 inches is light brown gravelly sandy clay loam, and the lower 17 inches is reddish yellow very stony clay. Hard, fractured obsidian is at a depth of 31 inches.

Permeability of the Arrowhead soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It can be used for production of timber and Christmas trees.

Proper site preparation on the Bottlerock and Glenview soils might make it possible to replace stands of brush and hardwoods with conifers. These soils are suited to the production of ponderosa pine. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 103 on the Bottlerock soil and 110 on the Glenview soil. The potential annual production of ponderosa pine on the Bottlerock soil is 400 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Glenview soil is 460 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for the Arrowhead soil have not been made because the vegetation is mostly brush.

Some concerns for the harvesting of timber are steepness of slope, the hazard of erosion, and the potential shredding effect of the obsidian on rubber tires.

The soils in this unit have a tendency to gully when the surface layer is removed. Disturbance of this protective layer can be reduced by the careful use of wheeled and tracked equipment. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Rocks and loose soil material may slide down roadcuts on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Glenview soil; however, revegetation of cut and fill slopes is difficult on the Bottlerock and Arrowhead soils because of the restricted available water capacity and the high content of rock fragments.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished on the Bottlerock and Glenview soils by planting large ponderosa pine seedlings following proper site preparation. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Planting on the Arrowhead soil is not practical because of the restricted available water capacity. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are blueblossom ceanothus, interior live oak, and manzanita.

This map unit is in capability subclass VIs (5), nonirrigated.

119—Bressa-Millsholm loams, 8 to 15 percent slopes. This map unit is on hills. The vegetation is mainly annual grasses and oaks. Elevation is 1,200 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 50 percent Bressa loam and 30 percent Millsholm loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Rock outcrop and small areas with stones on the surface. Also included are small areas of Bressa and Millsholm soils that have slopes of less than 8 percent, soils that are similar to the Bressa and Millsholm soils but receive more than 40 inches of precipitation annually, and soils that are similar to the Millsholm soil but are less than 10 inches deep to bedrock. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Bressa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray and pale brown loam 12 inches thick. The subsoil is light yellowish brown clay loam 14 inches thick. Fractured sandstone is at a depth of 26 inches.

Permeability of the Bressa soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 3 inches thick. The subsoil is pale brown clay loam 8 inches thick. Fractured sandstone is at a depth of 11 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover in some areas and the restricted available water capacity and shallow depth of the Millsholm soil. Where oaks are present, forage production can be increased by managed harvesting of the trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes from 13 to 36 cords of wood per acre have been measured on the Bressa soil. The Bressa soil responds well to fertilization, rangeland seeding, and proper grazing use. The main limitation for seeding is the woody canopy cover. Among the common understory plants on this unit are wild oat, soft chess, and filaree.

If this unit is used for homesite development, the main limitation is depth to bedrock. Another limitation is the moderately slow permeability of the Bressa soil. Cuts needed to provide building sites can expose bedrock. Shallow depth to bedrock in the Millsholm soil is a major limitation for septic tank absorption fields. If the Bressa soil is used for septic tank absorption fields, the limitations of depth to bedrock and moderately slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIe (15), nonirrigated.

120—Bressa-Millsholm loams, 15 to 30 percent slopes. This map unit is on hills. The vegetation is mainly annual grasses and oaks. Elevation is 1,200 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Bressa loam and 35 percent Millsholm loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Etsel, Hopland, Maymen, Skyhigh, and Snook soils. Also included are small areas of soils that are similar to the Bressa soil but receive more than 40 inches of precipitation annually. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Bressa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray and pale brown loam 12 inches thick. The subsoil is light yellowish brown clay loam 14 inches thick. Fractured sandstone is at a depth of 26 inches.

Permeability of the Bressa soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 3 inches thick. The subsoil is pale brown clay loam 8 inches thick. Fractured sandstone is at a depth of 11 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover in some areas and the restricted available water capacity and shallow depth of the Millsholm soil. Where blue oak exists, forage production can be increased by managed harvesting of the trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 13 to 36 cords of wood per acre have been measured on the Bressa soil. The Bressa soil responds well to fertilization and rangeland seeding. The main limitation for seeding is the woody canopy cover. Among the common understory plants are soft chess, wild oat, and filaree.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and the depth to bedrock. Other limitations are the moderately slow permeability and low load bearing capacity of the Bressa soil. Extensive cutting and filling generally are required to provide roadbeds and building sites. Cuts can expose bedrock. Cut and fill slopes are susceptible to erosion. The risk of erosion is increased if the soil surface is left exposed during construction. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Shallow depth to bedrock in the Millsholm soil is a major limitation for septic tank absorption fields. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitations of depth to bedrock in the Millsholm and Bressa soils and moderately slow permeability of the Bressa soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the limited ability of the Bressa soil to support a load.

This map unit is in capability subclass VIe (15), nonirrigated.

121—Clear Lake clay, drained, cool. This very deep soil is in basins. It formed under poorly drained conditions; however, drainage has been improved in most areas as a result of entrenchment of stream channels. Some areas, particularly in Big Valley near Clear Lake, are still poorly drained. The soil formed in lacustrine deposits derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and scattered oaks. Elevation is 1,300 to 1,400 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is very dark gray and dark gray clay 41 inches thick. The upper 15 inches of the underlying material is grayish brown clay, and the lower part to a depth of 72 inches is pale brown clay loam. Lime commonly occurs below a depth of 6 to 28 inches.

Included in this unit are small areas of Clear Lake Variant and Cole soils and Xerofluvents. Also included are small areas of soils that are similar to this Clear Lake soil but do not have a seasonal high water table. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Clear Lake soil is slow. Available water capacity is 8.5 to 10.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 36 to 60 inches in winter and spring. The water table drops to a depth of 60 inches or more during the growing season. This soil is subject to rare periods of flooding or ponding during prolonged, high-intensity storms. The shrink-swell potential is high.

This unit is used mainly for orchards, vineyards (fig. 2), and hay and pasture. It is also used for homesite development.

The major crops grown on this unit are wine grapes, pears, and walnuts. Irrigation commonly is used for maximum production of these crops. The main limitations are slow permeability, the seasonal high water table, the hazard of flooding or ponding, and the presence of lime. Because of the slow permeability, the application of water should be regulated so that water does not stand

Figure 2.—Irrigated wine grape vineyard in an area of Clear Lake clay, drained, cool.

on the surface for long periods of time and damage the crops. The seasonal high water table may limit the suitability of this unit for deep-rooted perennial crops. Artificial drainage may be necessary. Capital improvements on this unit should be designed to withstand flooding. Chelated iron may have to be applied to correct lime-induced chlorosis.

If this unit is used for hay and pasture, the main limitation is the slow permeability. The application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the seasonal high water table, slow permeability, high shrink-swell potential, and low load bearing capacity. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level. The soil in this unit is poorly suited to septic tank absorption fields because of the seasonal high water table and slow permeability. Increasing the size of the absorption field or using a specially designed sewage disposal system can help to compensate for the slow permeability. The high shrink-swell potential and the low load bearing capacity of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIw-5 (14), irrigated, and IIIw-5 (14), nonirrigated.

122—Clear Lake Variant clay, drained. This very deep soil is in basins. It formed under poorly drained conditions; however, drainage has been improved as a result of entrenchment of stream channels. Some areas, particularly in Big Valley near Clear Lake, are still poorly drained. The soil formed in lacustrine deposits derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered oaks. Elevation is 1,300 to 2,000 feet. The average annual precipitation is 25 to 35

inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is very dark gray clay 38 inches thick. The upper 25 inches of the underlying material is dark and light gray clay, and the lower part to a depth of 72 inches is pale olive clay loam.

Included in this unit are small areas of Clear Lake and Cole soils and Xerofluvents. Also included are small areas of soils that are similar to this Clear Lake Variant soil but have a seasonal high water table at a depth of 12 to 36 inches or do not have a seasonal high water table at all. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Clear Lake Variant soil is slow. Available water capacity is 8.5 to 10.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 36 to 60 inches in winter and spring. The water table drops to a depth of 60 inches or more during the growing season. This soil is subject to rare periods of flooding or ponding during prolonged, high-intensity storms. The shrink-swell potential is high.

This unit is used mainly for orchards, vineyards, and hay and pasture. It is also used for homesite development.

The major crops grown on this unit are wine grapes, pears, and walnuts. Irrigation commonly is used for maximum production of these crops. The main limitations are the slow permeability, the seasonal high water table, and the hazard of flooding or ponding. Because of the slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops. The seasonal high water table may limit the suitability of this unit for deep-rooted perennial crops. Artificial drainage may be necessary. Capital improvements on this unit should be designed to withstand flooding.

If this unit is used for hay and pasture, the main limitation is the slow permeability. The application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops.

If this unit is used for homesite development, the main limitations are the hazard of flooding, seasonal high water table, slow permeability, high shrink-swell potential, and low load bearing capacity. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level. This unit is poorly suited to septic tank absorption fields because of the seasonal high water table and slow permeability. Increasing the size of the absorption field or using a specially designed sewage disposal system can help to compensate for the slow permeability. The high shrink-swell potential of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIw-5 (14), irrigated, and IIIw-5 (14), nonirrigated.

123—Cole clay loam, drained. This very deep soil is in basins and on flood plains. It formed under somewhat poorly drained conditions; however, drainage has been improved in most areas as a result of entrenchment of stream channels. Some areas, particularly in Big Valley near Clear Lake, are still somewhat poorly drained. The soil formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 1,100 to 1,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is grayish brown clay loam 6 inches thick. The upper 29 inches of the subsoil is grayish brown and gray clay loam, and the lower 27 inches is pale brown and grayish brown clay loam. The substratum to a depth of 71 inches is brown and pale brown clay loam. In some areas the surface layer is silty clay loam.

Included in this unit are small areas of Clear Lake Variant, Cole Variant, Kelsey, Lupoyoma, and Still soils and Xerofluvents. Xerofluvents are adjacent to stream channels. Also included are small areas of calcareous soils in more poorly drained areas. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Cole soil is slow. Available water capacity is 7.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to rare periods of flooding or ponding during prolonged, high-intensity storms. The shrink-swell potential is high.

This unit is used mainly for orchards and vineyards. It is also used for hay and pasture and homesite development.

The major crops grown on this unit are pears, walnuts, and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitations are slow permeability and the hazard of flooding or ponding. Because of the slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops. Capital improvements on this unit should be designed to withstand flooding.

If this unit is used for hay and pasture, the main limitation is slow permeability. The application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops.

If this unit is used for homesite development, the main limitations are the hazard of flooding, slow permeability, high shrink-swell potential, and low load bearing capacity. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level. If this unit is used for septic tank absorption fields, increasing the size of the absorption fields or using a specially designed disposal system can help to compensate for the slow permeability. The high shrink-swell potential and the low load bearing capacity of the soil should be considered when designing and constructing foundations, concrete structures, and paved roads. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIs-3 (14), irrigated, and IIIs-3 (14), nonirrigated.

124—Cole Variant clay loam. This very deep, moderately well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses, forbs, and a few scattered oaks. Elevation is 1,300 to 2,400 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is grayish brown clay loam 8 inches thick. The underlying material to a depth of 60 inches or more is dark gray and grayish brown clay.

Included in this unit are small areas of Clear Lake, Lupoyoma, and Still soils. Also included are small areas of soils that are similiar to this Cole Variant soil but have a calcareous substratum. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Cole Variant soil is slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. The shrink-swell potential is high. This soil is subject to rare periods of flooding or ponding during prolonged, high-intensity storms.

Most areas of this unit are used for orchards, vineyards, and hay and pasture. Some areas are used for homesite development.

The major crops grown on this unit are wine grapes, pears, and walnuts. Irrigation commonly is used for maximum production of these crops. The main limitations are the slow permeability and the hazard of flooding or ponding. Because of the slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods. Capital improvements should be designed to withstand flooding.

If this unit is used for hay and pasture, the main limitation is slow permeability. The application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops.

If this unit is used for homesite development, the main limitations are the slow permeability, high shrink-swell potential, low load bearing capacity, and the hazard of flooding. Increasing the size of the septic tank absorption field or using a specially designed sewage disposal system can help to compensate for the slow permeability. The high shrink-swell potential and the low load bearing capacity of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability unit IIs-3 (14), irrigated, and IIIs-3 (14), nonirrigated.

125—Cole Variant clay loam, calcareous substratum. This very deep, moderately well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs and a few scattered oaks. Elevation is 1,300 to 1,400 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is dark grayish brown clay loam 20 inches thick. The underlying material to a depth of 60 inches or more is dark grayish brown clay. The soil is calcareous below a depth of 30 inches.

Included in this unit are small areas of Cole soils, noncalcareous Cole Variant soils, and Still soils. Also included are small areas of soils that are similar to this Cole Variant soil but are gravelly in the surface layer and have less clay. Included areas make up about 30

percent of the total acreage. The percentage varies from one area to another.

Permeability of this Cole Variant soil is slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. The shrink-swell potential is high. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to rare periods of flooding or ponding during prolonged, high-intensity storms.

This unit is used mainly for hay and pasture, orchards, and vineyards. It is also used for homesite development.

If this unit is used for hay and pasture, the main limitation is slow permeability. The application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops.

The main crops grown on this unit are wine grapes, pears, and walnuts. Irrigation commonly is used for maximum production of these crops. The main limitations are slow permeability, the presence of lime, and the hazard of flooding or ponding. Because of the slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods. Chelated iron commonly is applied by local growers to correct lime-induced chlorosis. Capital improvements on this unit should be designed to withstand flooding.

If this unit is used for homesite development, the main limitations are the slow permeability, high shrink-swell potential, low load bearing capacity, and the hazard of flooding. Increasing the size of the septic tank absorption fields or using a specially designed sewage disposal system can help to compensate for the slow permeability. The high shrink-swell potential and the low load bearing capacity of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability unit IIs-3 (14), irrigated, and IIIs-3 (14), nonirrigated.

126—Collayomi complex, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and oaks. Elevation is 1,400 to 4,000 feet. The average annual precipitation is 35 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 40 percent Collayomi very gravelly loam and 35 percent Collayomi stony loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken and Whispering soils and Rock outcrop. The Aiken soils are on side slopes, and the Whispering soils and Rock outcrop are on ridges. Also included are small areas of Collayomi soils that have slopes of less than 50 percent and soils that are similar to the Collayomi soils but have slopes of more than 75 percent or have a clay subsoil. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Collayomi very gravelly loam is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 10 percent of the surface is covered with stones and boulders. The surface layer is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam.

Permeability of the Collayomi very gravelly loam is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

The Collayomi stony loam is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, about 25 percent of the surface is covered stones and boulders 2 to 8 feet in diameter. The surface layer is dark reddish gray stony loam 4 inches thick. The upper 24 inches of the subsoil is light reddish brown very cobbly clay loam, and the lower 24 inches is reddish yellow very cobbly loam. In some areas the surface layer is cobbly loam.

Permeability of the Collayomi stony loam is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 to 80 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for timber production.

Ponderosa pine, California black oak, Douglas-fir, and sugar pine are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index is 122 for ponderosa pine and 110 for Douglas-fir. The potential annual production of ponderosa pine is 595 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine and black oak have not been made.

The main limitations for the harvesting of timber are the steepness of slope and hazard of erosion. Steepness of slope limits the use of wheeled and tracked equipment in skidding. Cable yarding systems generally disturb the soil less. Stones and boulders on the surface hinder harvesting operations in some areas. Rock for construction of roads generally is available on this unit. Roads may fail and landslides may occur if

deep road cuts are made on the steeper parts of this unit.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir frequently occurs. Areas of Rock outcrop limit the even distribution of reforestation.

Among the common forest understory plants are squawcarpet, coffeeberry, poison-oak, brackenfern, manzanita, and perennial grasses.

This map unit is in capability subclass VIIs (5), nonirrigated.

127—Collayomi-Aiken-Whispering complex, 5 to 30 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and oaks. Elevation is 1,400 to 4,000 feet. The average annual precipitation is 35 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 35 percent Collayomi very gravelly loam, 35 percent Aiken loam, and 15 percent Whispering loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Rock outcrop near ridges. Also included are small areas of Aiken, Collayomi, and Whispering soils that have slopes of more than 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Collayomi soil is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, about 5 percent of the surface is covered with stones and boulders. The surface layer is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam.

Permeability of the Collayomi soil is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Aiken soil is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 1 inch thick. The upper 5 inches of the surface layer is reddish brown loam, and the lower 4 inches is reddish brown clay loam. The upper 11 inches of the subsoil is yellowish red clay loam, and the lower 54 inches is reddish yellow clay and cobbly clay.

Permeability of the Aiken soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Whispering soil is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, about 5 percent of the surface is covered with stones and boulders. The surface is covered with a mat of pine needles and twigs 1 inch thick. The surface layer is brown loam 5 inches thick. The upper 10 inches of the subsoil is reddish yellow gravelly loam, and the lower 11 inches is yellowish red very cobbly clay loam. Hard, fractured andesite is at a depth of 26 inches.

Permeability of the Whispering soil is moderate. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed. It is also used for homesite development and orchards.

Ponderosa pine, California black oak, sugar pine, and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 122 on the Collayomi soil, 137 on the Aiken soil, and 109 on the Whispering soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 110 on the Collayomi soil, 134 on the Aiken soil, and 107 on the Whispering soil. The potential annual production of ponderosa pine on the Collayomi soil is 595 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Aiken soil is 800 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Whispering soil is 455 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine and California black oak have not been made.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails on the Aiken soil are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on the steep cut and fill slopes reduces erosion. Revegetation of cut and fill slopes is difficult on the Collayomi and Whispering soils because of the high content of rock fragments and the restricted available water capacity.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir frequently occurs. The high soil temperature and low content of soil moisture during the growing season cause high mortality of

Douglas-fir seedlings, especially on the south- and southwest-facing slopes.

Among the common forest understory plants are squawcarpet, coffeeberry, poison-oak, brackenfern, manzanita, and perennial grasses.

If this unit is used for homesite development, the main limitations are the steepness of slope and hazard of erosion. Other limitations are the moderately slow permeability and low load bearing capacity of the Aiken soil and the depth to bedrock in the Whispering soil. Cutting and filling generally are required to provide level building sites. Cuts can expose bedrock in the Whispering soil. Cut and fill slopes are susceptible to excessive erosion. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Cut and fill slopes on the Aiken soil are not stable and are subject to slumping. Buildings and roads should be designed to offset the limited ability of the subsoil in the Aiken soil to support a load. If the Aiken soil is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitations of moderately slow permeability of the Aiken soil and moderate depth to bedrock in the Whispering soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The main crop grown on this unit is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. Walnut orchards are primarily in areas of the Aiken and Collayomi soils that have slopes of 5 to 15 percent. The main limitations are the hazard of erosion and steepness of slope. Available water capacity and stones and boulders on the surface also limit use of the Collayomi soil. The Whispering soil is poorly suited to orchards. It is also limited by depth to bedrock, available water capacity, and stones and boulders on the surface. Areas of this unit that have slopes of more than 15 percent are poorly suited to orchards. Use of a cover crop between rows of trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum. Adding organic matter to the soil increases the available water capacity and fertility. Stones and boulders on the surface limit the use of most equipment on the Collayomi and Whispering soils. Rock deflectors should be used on all moving equipment.

This map unit is in capability unit IVs-1 (5), nonirrigated.

128—Collayomi-Aiken-Whispering complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and oaks. Elevation is 1,400 to 4,000 feet. The average annual precipitation is 35 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 40 percent Collayomi very gravelly loam, 35 percent Aiken loam, and 15 percent Whispering loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken and Whispering soils that have slopes of less than 30 percent. Also included are small areas of soils that are similar to the Collayomi soil but have more clay in the subsoil. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Collayomi soil is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 5 percent of the surface is covered with stones and boulders. The surface layer is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam.

Permeability of the Collayomi soil is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Aiken soil is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 1 inch thick. The upper part of the surface layer is reddish brown loam 5 inches thick, and the lower part is reddish brown clay loam 4 inches thick. The upper 11 inches of the subsoil is yellowish red clay loam, and the lower 54 inches is reddish yellow clay and cobbly clay.

Permeability of the Aiken soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Whispering soil is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 5 percent of the surface is covered with stones and boulders. The surface is covered with a mat of pine needles and twigs 1 inch thick. The surface layer is brown loam 5 inches thick. The upper 10 inches of the subsoil is reddish yellow gravelly loam, and the lower 11 inches is yellowish red very cobbly clay loam. Hard, fractured andesite is at a depth of 26 inches.

Permeability of the Whispering soil is moderate. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of water erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed. It is also used for homesite development.

Ponderosa pine, California black oak, sugar pine, and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 122 on the Collayomi soil, 137 on the Aiken soil, and 109 on the Whispering soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 110 on the Collayomi soil, 134 on the Aiken soil, and 107 on the Whispering soil. The potential annual production of ponderosa pine on the Collayomi soil is 595 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Aiken soil is 800 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Whispering soil is 455 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine and California black oak have not been made.

Some concerns for the harvesting of timber are steepness of slope, the hazard of erosion, and seasonal soil wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails on the Aiken soil are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is available in some areas of this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Aiken soil. Revegetation of cut and fill slopes is difficult on the Collayomi and Whispering soils because of the high content of rock fragments and restricted available water capacity.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by conifers occurs frequently. The high soil temperature and low content of soil moisture during the growing season cause high mortality of Douglas-fir seedlings, especially on the south- and southwest-facing slopes.

Among the common forest understory plants are squawcarpet, coffeeberry, poison-oak, brackenfern, manzanita, and perennial grasses.

If this unit is used for homesite development, the main limitations are the steepness of slope and hazard of erosion. Other limitations are the moderately slow permeability and low load bearing capacity of the Aiken soil and depth to bedrock in the Whispering soil. Preferred building sites are limited to knolls and the less sloping areas. Extensive cutting and filling generally are required. Cuts needed to provide building sites can expose bedrock in the Whispering soil. Cut and fill slopes are susceptible to erosion. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Cut and fill slopes on the Aiken soil are not stable and are subject to slumping. Buildings and roads should be designed to offset the limited ability of the Aiken soil to support a load. If the Aiken soil is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability. Steepness of slope is a major limitation for septic tank absorption fields. Absorption lines should be installed on the contour. The limitations of moderately slow permeability of the Aiken soil and moderate depth to bedrock in the Whispering soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIs (5), nonirrigated.

129—Collayomi-Whispering complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and oaks with an understory of shrubs. Elevation is 3,000 to 4,600 feet. The average annual precipitation is 50 to 65 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 120 to 160 days.

This unit is about 60 percent Collayomi very gravelly loam and 30 percent Whispering loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken loam and Collayomi stony loam. Also included are small areas of Collayomi and Whispering soils that have slopes of more than 50 percent or less than 30 percent and soils that are similar to the Whispering soil but are 40 to 60 inches deep. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Collayomi soil is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 5 percent of the surface is covered with stones and boulders. The surface layer is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam.

Permeability of the Collayomi soil is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Whispering soil is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 5 percent of the surface is covered with stones and boulders. The surface is covered with a mat of pine needles, leaves, and twigs 1 inch thick. The surface layer is brown loam 5 inches thick. The upper 10 inches of the subsoil is reddish

yellow gravelly loam, and the lower 11 inches is yellowish red very cobbly clay loam. Hard, fractured andesite is at a depth of 26 inches.

Permeability of the Whispering soil is moderate. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed. It is also used for homesite development.

Ponderosa pine, California black oak, sugar pine, and Douglas-fir are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 122 on the Collayomi soil and 109 on the Whispering soil. The potential annual production of ponderosa pine on the Collayomi soil is 595 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Whispering soil is 450 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine, California black oak, and Douglas-fir have not been made.

A concern for the harvesting of timber is steepness of slope. Stones and boulders on the surface hinder harvesting in some areas. Revegetation of cut and fill slopes is difficult on the Collayomi and Whispering soils because of the high content of rock fragments and the restricted available water capacity. Rock for construction of roads generally is available on this unit.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir occurs periodically. The high soil temperature and low content of soil moisture during the growing season cause high mortality of Douglas-fir seedlings, especially on the south- and southwest-facing slopes.

Among the common forest understory plants are squawcarpet, coffeeberry, poison-oak, brackenfern, manzanita, and perennial grasses.

If this unit is used for homesite development, the main limitations are the steepness of slope and hazard of erosion. Another limitation is depth to bedrock in the Whispering soil. Preferred building sites are limited to knolls and the less sloping areas. Steepness of slope presents many problems if this unit is used for homesite development. Extensive cutting and filling generally are required. Cuts needed to provide building sites can expose bedrock on the Whispering soil. Cut and fill slopes are susceptible to erosion. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion. Steepness of slope is a major limitation for septic tank absorption fields. Absorption lines should be installed on the contour. The limitation of moderate depth to bedrock in the Whispering soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIs (5), nonirrigated.

130—Deadwood-Sheetiron association, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly shrubs with some mixed conifers and hardwoods. Elevation is 3,500 to 5,200 feet. The average annual precipitation is 45 to 60 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 50 percent Deadwood very gravelly sandy loam and 30 percent Sheetiron gravelly sandy loam. The Deadwood soil is on ridges and south- and west-facing slopes. The Sheetiron soil is on north- and east-facing slopes and benches.

Included in this unit are small areas of Bamtush, Freezeout, Neuns, and Yollabolly soils and Rock outcrop. Also included are small areas of Deadwood and Sheetiron soils that have slopes of less than 50 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sheetiron soil is moderately deep and well drained. It formed in material weathered from mica-quartz schist. The upper part of the surface layer is brown gravelly sandy loam 3 inches thick, and the lower part is pale brown very gravelly sandy loam 5 inches thick. The upper 9 inches of the subsoil is pale brown very gravelly sandy loam, and the lower 12 inches is very pale brown extremely gravelly sandy loam. Fractured mica-quartz schist is at a depth of 29 inches.

Permeability of the Sheetiron soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for timber production.

Canyon live oak, incense-cedar, and scattered Douglas-fir, sugar pine, and ponderosa pine are the main tree species on the Deadwood soil. Douglas-fir,

ponderosa pine, sugar pine, and California black oak are the main tree species on the Sheetiron soil. Among the trees of limited extent are white fir on some north aspects and canyon live oak on some south aspects. On the basis of a 100-year site curve, the mean site index is estimated to be 105 for both ponderosa pine and Douglas-fir on the Sheetiron soil. On the basis of a 100-year site curve, the mean site index is 84 for ponderosa pine and 83 for Douglas-fir on the Deadwood soil. The potential annual production of ponderosa pine on the Sheetiron soil is 425 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for the Deadwood soil have not been made because the vegetation is mostly brush.

The main limitation for the harvesting of timber is steepness of slope. Cable yarding systems generally are used on this unit. Revegetation of cut and fill slopes is difficult on the soils in this unit because of the high content of rocks in the soils and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts, necessitating increased maintenance on roads. Rock for construction of roads is available on this unit but frequently is of low quality. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, treatment of the surface is needed to reduce dustiness.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Movement of loose surface material can reduce seedling survival on the steeper slopes. Even with seed trees present, natural reforestation of cutover areas by conifers occurs infrequently on this unit. Reforestation of the Sheetiron soil can be accomplished by planting seedlings. Planting on the Deadwood soil is not practical because of the high content of rocks and the restricted available water capacity of the soil.

Among the common forest understory plants are California nutmeg and greenleaf manzanita.

This map unit is in capability subclass VIIs (5), nonirrigated.

131—Fluvaquentic Haplaquolls, nearly level. These very deep, very poorly drained soils are in lake marshes. They formed in lacustrine deposits derived from mixed sources. Slope is 0 to 2 percent. The vegetation is mainly tules, rushes, and other water-tolerant plants. Elevation is 1,325 to 1,350 feet. The average annual precipitation is 22 to 30 inches, the average annual air temperature is 54 to 58 degrees F, and the average frost-free period is 170 to 210 days.

No single profile is typical of these Fluvaquentic Haplaquolls, but one commonly observed in the survey area has a surface layer of grayish brown silty clay loam and loam 5 inches thick. The underlying material to a depth of 40 inches or more is stratified, light yellowish brown gravelly loamy coarse sand, olive gray silty clay loam, grayish brown sand, and light olive gray silt loam. The soil below this depth is continuously saturated.

Included in this unit are small areas of Clear Lake clay and Cole Variant and Tulelake soils. Also included are small areas of soils that are similar to these Fluvaquentic Haplaquolls but have less clay or more clay. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Fluvaquentic Haplaquolls is slow. Available water capacity is 7.5 to 10.5 inches when drained. Available water capacity and rooting depth are dependent on the water table, which fluctuates between 1 foot above the surface and 3 feet below the surface annually. Surface runoff is ponded, and the hazard of erosion is slight. This soil is inundated for long periods in winter and spring.

This unit is used mainly as wildlife habitat.

This unit is well suited to wetland wildlife habitat.

This map unit is in capability subclass VIw (14), nonirrigated.

132—Forbesville loam, 2 to 5 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is mainly brush, oaks, and annual grasses. Elevation is 1,350 to 1,550 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is brown loam 6 inches thick. The upper 10 inches of the subsoil is yellowish red loam, and the lower 14 inches is red clay. Below this to a depth of 70 inches is red very gravelly clay and reddish yellow very gravelly clay loam.

Included in this unit are small areas of Wappo Variant and Manzanita soils. Also included are small areas, along drainageways, of Forbesville soils that have slopes of more than 5 percent and soils that are similar to this Forbesville soil but are neutral in reaction. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Forbesville soil is slow. Available water capacity is 5.5 to 8.0 inches. Effecting rooting depth is 60 inches or more. The clay layer in the subsoil can restrict root penetration. Surface runoff is slow, and the hazard of erosion is slight. The shrink-swell potential in the subsoil is high.

This unit is used mainly for orchards, vineyards, and homesite development. It is also used for hay and pasture, livestock grazing, and firewood production.

The main crops grown on this unit are walnuts and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitation is the slow permeability of the soil. Because of this limitation, irrigation water needs to be applied slowly to minimize runoff.

If this unit is used for homesite development, the main limitations are the slow permeability, high shrink-swell potential in the subsoil, and low load bearing capacity. If this unit is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The shrink-swell potential and low load bearing capacity of the soil in this unit should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads or streets, it can be mixed with sand and gravel to increase its strength and stability.

If this unit is used for hay and pasture, the main limitation is the slow permeability. Irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and protects the soil from compaction.

The production of forage is limited because of the tendency of this unit to produce woody species. If trees and shrubs are managed to create open areas, this unit can produce a good stand of forage plants. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 to 35 cords of wood per acre have been measured on this unit. The soil in this unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. The characteristic plant community in uncultivated areas is mainly blue oak, soft chess, and manzanita.

This map unit is in capability units IIe-3 (14), irrigated, and IIIe-3 (14), nonirrigated.

133—Forbesville loam, 5 to 15 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is mainly brush, oak, and annual grasses. Elevation is 1,350 to 1,550 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is brown loam 6 inches thick. The upper 10 inches of the subsoil is yellowish red loam, and the lower 14 inches is red clay. Below this to a depth of 70 inches is red very gravelly clay and reddish yellow very gravelly clay loam.

Included in this unit are small areas of Manzanita and Wappo soils. Also included are small areas of Forbesville soils that have slopes of 2 to 5 percent and soils that are similar to this Forbesville soil but have slopes of more than 15 percent or are neutral in reaction. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Forbesville soil is slow. Available water capacity is 5.5 to 8.0 inches. Effective rooting depth is 60 inches or more. The clay layer in the subsoil can restrict root penetration. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential of the subsoil is high.

This unit is used mainly for orchards, vineyards, and homesite development. It is also used for hay and pasture, livestock grazing, and firewood production.

The main crops grown on this unit are walnuts and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitations are the slow permeability of the soil, the hazard of erosion, and steepness of slope. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of a cover crop between rows of trees or vines helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for homesite development, the main limitations are the slow permeability, high shrink-swell potential in the subsoil, and low load bearing capacity. If the unit is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The shrink-swell potential and low load bearing capacity of the soil in this unit should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads or streets, it can be mixed with sand and gravel to increase its strength and stability.

If this unit is used for hay and pasture, the main limitations are the slow permeability and hazard of erosion. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from compaction and erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

The production of forage is limited because of the tendency of this unit to produce woody species. If trees and shrubs are managed to create open areas, this unit can produce a good stand of forage plants. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 to 35 cords of wood per acre have been measured on this unit. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. The characteristic plant community in uncultivated areas is mainly blue oak, soft chess, and manzanita.

This map unit is in capability unit IIIe-1 (14), irrigated and nonirrigated.

134—Forward Variant-Kidd association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly hardwoods and conifers with an understory of scattered brush and forbs. Elevation is 2,000 to 3,500 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 145 to 180 days.

This unit is about 50 percent Forward Variant very gravelly loam and 20 percent Kidd gravelly loam. The Forward Variant soil is on mountainsides and toe slopes, and the Kidd soil is on ridgetops and spur ridges and is adjacent to included areas of Rock outcrop on mountainsides.

Included in this unit are small areas of Aiken soils in drainageways and Rock outcrop near ridges. Also included are small areas of Forward Variant and Kidd soils that have slopes of more than 50 percent and soils that are similar to the Kidd soil but are less than 10 inches deep. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Forward Variant soil is very deep and well drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is very pale brown very gravelly loam 7 inches thick. The subsoil is very pale brown and light gray very gravelly loam 55 inches thick. Fractured rhyolitic tuff is at a depth of 62 inches. In some areas the surface layer is gravelly loam.

Permeability of the Forward Variant soil is moderately rapid. Available water capacity is 4.5 to 8.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Kidd soil is shallow and somewhat excessively drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is light gray gravelly loam 4 inches thick. The subsoil is light gray gravelly sandy loam 9 inches thick. Rhyolitic tuff is at a depth of 13 inches.

Permeability of the Kidd soil is moderately rapid. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, and sugar pine are the main tree species on the Forward Variant soil. On the basis of a 100-year site curve, the mean site index is 123 for ponderosa pine and 127 for Douglas-fir. The potential annual production of ponderosa pine is 610 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine have not been made. Among the trees of limited extent are knobcone pine, which is in areas that have been burned repeatedly, tanoak, California black oak, Pacific madrone, and interior live oak. Estimates of the site index and yield for the Kidd soil have not been made because it supports mostly brush.

The main limitations for the harvesting of timber are steepness of slope and the hazard of erosion. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable yarding systems. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Plant competition is a concern in the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting ponderosa pine, sugar pine, or Douglas-fir seedlings on the Forward Variant soil. Even with seed trees present, natural reforestation of cutover areas by ponderosa pine, sugar pine, and Douglas-fir occurs infrequently because of understory plant competition. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are brackenfern, dogwood, manzanita, and toyon.

The Forward Variant soil is in capability subclass VIs (5), nonirrigated. The Kidd soil is in capability subclass VIe (5), nonirrigated.

135—Forward Variant-Kidd association, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly hardwood trees and conifers with an understory of brush and forbs. Elevation is 2,000 to 3,500 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 145 to 180 days.

This unit is about 50 percent Forward Variant very gravelly loam and 25 percent Kidd gravelly loam. The Forward Variant soil is on mountainsides and toe slopes, and the Kidd soil is on ridgetops and spur ridges. The Kidd soil also occurs randomly on mountainsides adjacent to included areas of Rock outcrop.

Included in this unit are small areas of Aiken and Mayacama soils and Rock outcrop. The Aiken soils are on toe slopes where tuffaceous material is dissected to

the underlying basalt, the Mayacama soils are on sandstone intrusions, and the Rock outcrop occurs on ridges or as escarpments. Also included are small areas of soils that are similar to the Forward Variant soil but are 20 to 40 inches deep and soils that are similar to the Kidd soil but are less than 10 inches deep. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Forward Variant soil is very deep and well drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is very pale brown very gravelly loam 7 inches thick. The subsoil is very pale brown and light gray very gravelly loam 55 inches thick. Fractured rhyolitic tuff is at a depth of 62 inches. In some areas the surface layer is gravelly loam.

Permeability of the Forward Variant soil is moderately rapid. Available water capacity is 4.5 to 8.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Kidd soil is shallow and somewhat excessively drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is light gray gravelly loam 4 inches thick. The subsoil is light gray gravelly sandy loam 9 inches thick. Rhyolitic tuff is at a depth of 13 inches.

Permeability of the Kidd soil is moderately rapid. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, and sugar pine are the main tree species on the Forward Variant soil. On the basis of a 100-year site curve, the mean site index is 123 for ponderosa pine and 127 for Douglas-fir. The potential annual production of ponderosa pine is 610 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine have not been made. Among the trees of limited extent are knobcone pine, which is in areas that have been burned repeatedly, tanoak, California black oak, Pacific madrone, and interior live oak. Estimates of the site index and yield for the Kidd soil have not been made because it supports mostly brush.

The main limitations for the harvesting of timber are steepness of slope and the hazard of erosion. When harvesting timber, steepness of slope limits the use of wheeled and tracked equipment in skidding. Cable yarding systems generally disturb the soil less. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Plant competition is a concern in the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting ponderosa pine, sugar pine, or Douglas-fir seedlings on the Forward Variant soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine, sugar pine, and Douglas-fir occurs infrequently. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are brackenfern, dogwood, manzanita, and toyon.

The Forward Variant soil is in capability subclass VIIs (5), nonirrigated, and the Kidd soil is in capability subclass VIIe (5), nonirrigated.

136—Freezeout-Yollabolly very gravelly sandy loams, 30 to 50 percent slopes. This map unit is on mountaintops. The vegetation is mainly mixed conifers. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 43 to 48 degrees F, and the average frost-free period is 90 to 130 days.

This unit is about 50 percent Freezeout very gravelly sandy loam and 30 percent Yollabolly very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Neuns, and Sheetiron soils and Rock outcrop. The Bamtush, Neuns, and Sheetiron soils are at the lower elevations in this unit. Also included are very deep, gravelly and very gravelly loams that have a frigid soil temperature and small areas of Freezeout and Yollabolly soils that have slopes of less than 30 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Freezeout soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed conifer needles, twigs, and bark 1 inch thick. The surface layer is dark grayish brown very gravelly sandy loam 5 inches thick. The upper 11 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 9 inches is yellowish brown very gravelly sandy loam. Hard metamorphosed sandstone is at a depth of 25 inches.

Permeability of the Freezeout soil is moderately rapid. Available water capacity is 2 to 3 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Yollabolly soil is shallow and excessively drained. It formed in material weathered from metamorphosed sandstone. The surface layer is brown very gravelly sandy loam about 5 inches thick. The underlying material is pale brown extremely gravelly fine sandy loam about 9 inches thick. Metamorphosed sandstone is at a depth of 14 inches.

Permeability of the Yollabolly soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for timber production, wildlife habitat, and watershed.

White fir, Jeffrey pine, and red fir are the main tree species on this unit. Among the trees of limited extent are ponderosa pine, sugar pine, incense-cedar, and Douglas-fir. On the basis of a 50-year site curve, the mean site index is 53 for white fir on the Freezeout soil. Estimates of the site index and yield for the Yollabolly soil have not been made because the vegetation is mostly brush. The potential annual production of white fir on the Freezeout soil is 565 board feet (International rule, one-eighth inch kerf) per acre from a fully stocked stand of trees. Areas of Rock outcrop reduce the yield substantially.

A concern for the harvesting of timber is steepness of slope. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally disturb the soil less. Snowpack limits the use of equipment and restricts access. Revegetation of cut and fill slopes is difficult on this unit because of the large amount of rock fragments in the soil and the restricted available water capacity. Rock for construction of roads is available on this unit.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. The mortality rate of seedlings is higher on ridgetops that are subject to strong, persistent winds than in other areas of this unit. Even with seed trees present, natural reforestation of cutover areas by conifers occurs infrequently. Reforestation on the Freezeout soil can be accomplished by planting large seedlings. Planting on the Yollabolly soil is not practical because of the large amount of rock fragments on the surface and in the soil.

Among the common forest understory plants are huckleberry oak, whitethorn, and lupine.

This map unit is in capability subclass VIIs (5), nonirrigated.

137—Freezeout-Yollabolly very gravelly sandy loams, 50 to 75 percent slopes. This map unit is on mountaintops. The vegetation is mainly mixed conifers with some shrubs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 43 to 48 degrees F, and the average frost-free period is 90 to 130 days.

This unit is about 45 percent Freezeout very gravelly sandy loam and 30 percent Yollabolly very gravelly sandy loam. The components of this unit are so intricately intermingled that is was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Sheetiron, and Neuns soils and Rock outcrop. The Bamtush, Neuns, and Sheetiron soils are in the lower lying areas in the unit. Also included are very deep, gravelly and very gravelly loams that have a frigid soil temperature and small areas of Freezeout and Yollabolly soils that have slopes of less than 50 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Freezeout soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed conifer needles, twigs, and bark 1 inch thick. The surface layer is dark grayish brown very gravelly sandy loam 5 inches thick. The upper 11 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 9 inches is yellowish brown very gravelly sandy loam. Hard metamorphosed sandstone is at a depth of 25 inches.

Permeability of the Freezeout soil is moderately rapid. Available water capacity is 2 to 3 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Yollabolly soil is shallow and excessively drained. It formed in material weathered from metamorphosed sandstone. The surface layer is brown very gravelly sandy loam about 5 inches thick. The underlying material is pale brown extremely gravelly fine sandy loam about 9 inches thick. Metamorphosed sandstone is at a depth of 14 inches.

Permeability of the Yollabolly soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

White fir, Jeffrey pine, and red fir are the main tree species on this unit. Among the trees of limited extent are sugar pine, ponderosa pine, incense-cedar, and Douglas-fir. On the basis of a 50-year site curve, the mean site index is 53 for white fir on the Freezeout soil. The potential annual production of white fir on the Freezeout soil is 565 board feet (International rule, one-eighth inch kerf) per acre from a fully stocked stand of trees. Estimates of the site index and yield for the Yollabolly soil have not been made because the vegetation is mostly brush.

The main limitation for the harvesting of timber is steepness of slope. Cable yarding systems generally are used on this unit. Snowpack limits the use of equipment and restricts access. Revegetation of cut and fill slopes is difficult on this unit because of the large amount of rock fragments in the soil and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts, necessitating increased maintenance on roads. Rock for construction of roads is available on this unit.

Seedling survival is a concern in the production and reforestation of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. The mortality rate of seedlings is higher on ridgetops that are subject to strong, persistent winds than in other areas of this unit. Movement of loose surface material can reduce seedling survival on the Yollabolly soil. Even with seed trees present, natural reforestation of cutover areas by conifers occurs infrequently. Reforestation on the Freezeout soil can be accomplished by planting large seedlings. Planting on the Yollabolly soil is not practical because of the large number of rocks on the surface and in the soil.

Among the common forest understory plants are huckleberry oak, whitethorn, and lupine.

This map unit is in capability subclass VIIs (5), nonirrigated.

138—Glenview-Arrowhead complex, 5 to 15 percent slopes. This map unit is on volcanic hills. The vegetation is mainly brush with a few scattered conifers. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 150 to 195 days.

This unit is about 60 percent Glenview very gravelly loam and 20 percent Arrowhead extremely gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that are similar to the Glenview soil but have 35 to 70 percent obsidian cobbles and stones throughout the profile or are in areas where the average annual temperature is more than 59 degrees. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Glenview soil is very deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown very gravelly loam 1 inch thick and the lower part is brown gravelly loam 5 inches thick. The upper 9 inches of the subsoil is reddish yellow clay loam, the next 25 inches is reddish yellow gravelly clay, and the lower 25 inches is reddish yellow gravelly clay loam. In some areas the surface layer is very gravelly sandy loam.

Permeability of the Glenview soil is moderately slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

The Arrowhead soil is moderately deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown extremely gravelly sandy loam 1 inch thick and the lower part is brown gravelly sandy loam 3 inches thick. The upper 4 inches of the subsoil is brown gravelly sandy loam, the next 6 inches is light brown gravelly sandy clay loam, and the lower 17 inches is reddish yellow very stony clay. Hard, fractured obsidian is at a depth of 31 inches. In some areas the surface layer is sandy loam.

Permeability of the Arrowhead soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for orchards, wildlife habitat, and watershed. It is also used for production of timber and Christmas trees.

The main crop grown on this unit is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. This unit is poorly suited to orchards. The hazard of erosion, the tendency of the soils to tie up phosphorus, and the very gravelly and extremely gravelly surface layer are the main limitations. The Arrowhead soil is also limited by depth and restricted available water capacity. Clean tillage in winter is a major cause of accelerated erosion. Use of a cover crop improves tilth and infiltration and reduces runoff and erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum. Diversions, lined waterways, and drop structures can be used to remove excess runoff and reduce erosion. The soils in this unit tie up phosphorus, which limits the amount that is available for the growth of plants. Phosphorous fertilizer may be needed. Rock fragments in the surface layer cause the rapid wear of tillage equipment. If a water supply is available, drip irrigation is the most suitable system for applying water to this unit. Sprinkler irrigation can be used, but water needs to be applied slowly to minimize runoff.

Proper site preparation on the Glenview soil can make it possible to replace stands of brush and hardwoods with conifers. This soil is suited to the production of ponderosa pine. On the basis of a 100-year site curve, the mean site index is 110 for ponderosa pine on the Glenview soil. The potential annual production of ponderosa pine is 460 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for the Arrowhead soil have not been made because it supports mostly brush.

A concern for the harvesting of timber is the potential shredding effect of the obsidian on rubber tires. The soils in this unit also have a tendency to gully when the surface layer is removed. Disturbance of this protective

layer can be reduced by the careful use of wheeled and tracked equipment. Establishing plant cover on steep cut and fill slopes reduces erosion on the Glenview soil; however, revegetation of cut and fill slopes is difficult on the Arrowhead soil because of the restricted available water capacity and high content of rock fragments.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished on the Glenview soil by planting large ponderosa pine seedlings following proper site preparation. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Planting on the Arrowhead soil is not practical because of the restricted available water capacity. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are blueblossom ceanothus, interior live oak, and manzanita.

The Glenview soil is in capability unit IVs-0 (5), nonirrigated, and the Arrowhead soil is in capability unit IVs-8 (5), nonirrigated.

139—Glenview-Arrowhead complex, 15 to 30 percent slopes. This map unit is on volcanic hills. The vegetation is mainly brush with a few scattered conifers. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 150 to 195 days.

This unit is about 50 percent Glenview very gravelly loam and 20 percent Arrowhead extremely gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of soils that are similar to the Glenview soil but have 35 to 60 percent cobbles and stones throughout the profile or are in areas where the average annual temperature is more than 59 degrees. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Glenview soil is very deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown very gravelly loam 1 inch thick and the lower part is brown gravelly loam 5 inches thick. The upper 9 inches of the subsoil is reddish yellow clay loam, the next 25 inches is reddish yellow gravelly clay, and the lower 25 inches is reddish yellow gravelly clay loam. In some areas the surface layer is very gravelly sandy loam.

Permeability of the Glenview soil is moderately slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Arrowhead soil is moderately deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown extremely gravelly sandy loam 1 inch thick and the lower part is brown gravelly sandy loam 3 inches thick. The upper 4 inches of the subsoil is brown gravelly sandy loam, the next 6 inches is light brown gravelly sandy clay loam, and the lower 17 inches is reddish yellow very stony clay. Hard, fractured obsidian is at a depth of 31 inches. In some areas the surface layer is sandy loam.

Permeability of the Arrowhead soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for orchards, wildlife habitat, and watershed. It can be used for production of timber and Christmas trees.

The main crop grown on this unit is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. This unit is poorly suited to orchards. The hazard of erosion, steepness of slope, tendency of the soils to tie up phosphorus, and the very gravelly and extremely gravelly surface layer are the main limitations. The Arrowhead soil is also limited by depth and restricted available water capacity. Clean tillage in winter is a major cause of accelerated erosion. Use of a cover crop is essential to reduce erosion. The cover crop will improve tilth and infiltration and reduce runoff and erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum. Steep slopes may limit the use of farm machinery. Diversions, lined waterways, and drop structures can be used to remove excess runoff and reduce erosion. The soils in this unit tie up large amounts of phosphorus, which limits the amount that is available for the growth of plants. Use of a phosphorous fertilizer may be needed. Rock fragments in the surface layer cause the rapid wear of tillage equipment. If a water supply is available, drip irrigation is the most suitable method for applying water to this unit. Sprinkler irrigation can be used, but water needs to be applied slowly to minimize runoff.

Proper site preparation on the Glenview soil might make it possible to replace stands of brush and hardwoods with conifers. This soil is suited to the production of ponderosa pine. On the basis of a 100-year site curve, the mean site index is 110 for ponderosa pine on the Glenview soil. The potential annual production of ponderosa pine is 460 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for the Arrowhead soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber is the potential shredding effect of the obsidian on rubber tires. The soils in this unit also have a tendency to gully when the surface layer is removed. Disturbance of this protective layer can be reduced by the careful use of wheeled and tracked equipment. Establishing plant cover on steep cut and fill slopes reduces erosion on the Glenview soil; however, revegetation of cut and fill slopes is difficult on the Arrowhead soil because of the restricted available water capacity and high content of rock fragments.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished on the Glenview soil by planting large ponderosa pine seedlings following proper site preparation. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Planting on the Arrowhead soil is not practical because of the restricted available water capacity. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are blueblossom ceanothus, interior live oak, and manzanita.

This map unit is in capability unit IVs-1 (5), nonirrigated.

140—Glenview-Bottlerock complex, 2 to 5 percent slopes. This map unit is on volcanic hills. The vegetation in areas not cultivated is mainly brush with scattered conifers. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 150 to 195 days.

This unit is about 60 percent Glenview very gravelly loam and 30 percent Bottlerock extremely gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Arrowhead soils. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Glenview soil is very deep and well drained. It formed in material weathered from obsidian. Typically, the upper part of the surface layer is brown very gravelly loam 1 inch thick and the lower part is brown gravelly loam 5 inches thick. The upper 9 inches of the subsoil is reddish yellow clay loam, the next 25 inches is reddish yellow gravelly clay, and the lower 25 inches is reddish yellow gravelly clay loam. In some areas the surface layer is very gravelly sandy loam.

Permeability of the Glenview soil is moderately slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight.

The Bottlerock soil is very deep and well drained. It formed in material weathered from obsidian. The soil commonly has a surface pavement that is 90 percent gravel. Typically, the upper 5 inches of the surface layer is dark grayish brown extremely gravelly loam, the next 4 inches is light gray very gravelly loam, and the lower 10 inches is very pale brown very gravelly loam. The upper 9 inches of the subsoil is very pale brown very gravelly sandy clay loam, the next 11 inches is light brown very gravelly clay loam, and the lower 24 inches is dark red strong brown and reddish yellow very gravelly clay.

Permeability of the Bottlerock soil is slow. Available water capacity is 2.5 to 6.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight.

This unit is used mainly as wildlife habitat and watershed. It is also used for orchards and timber production.

The main crop grown on this unit is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. The main limitations are the restricted available water capacity and surface pavement of the Bottlerock soil and the tendency of the soils to tie up phosphorus. These soils tie up phosphorus, limiting the amount that is available for the growth of plants. Adding organic matter to the soil improves fertility and the available water capacity. Use of phosphorous fertilizer may be necessary. Rock fragments on the surface of the Bottlerock soil cause rapid wear of tillage equipment.

Proper site preparation on this unit might make it possible to replace stands of brush and hardwoods with conifers. This unit is suited to the production of ponderosa pine. On the basis of a 100-year site curve, the mean site index for pondorosa pine is 110 on the Glenview soil and 103 on the Bottlerock soil. The potential annual production of ponderosa pine on the Glenview soil is 460 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Bottlerock soil is 400 board feet per acre from a fully stocked stand of trees.

A concern for the harvesting of timber is the potential shredding effect of the obsidian on rubber tires. The soils in this unit also have a tendency to gully when the surface layer is removed. Disturbance of this protective layer can be reduced by the careful use of wheeled and tracked equipment. Establishing plant cover on steep cut and fill slopes reduces erosion on the Glenview soil; however, revegetation of cut and fill slopes is difficult on the Bottlerock soil because of the restricted available water capacity and high content of rock fragments.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished by planting

large ponderosa pine seedlings following proper site preparation. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are blueblossom ceanothus, interior live oak, and manzanita.

The Glenview soil is in capability unit IVs-0 (5), nonirrigated, and the Bottlerock soil is in capability unit IVs-4 (5), nonirrigated.

141—Henneke-Montara complex, 8 to 15 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush, scattered conifers, and sparse annual grasses. Elevation is 900 to 3,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 50 percent Henneke gravelly loam and 30 percent Montara clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Millsholm soils and Rock outcrop. Also included are small areas of soils that are similar to the Henneke and Montara soils but are 20 to 40 inches deep to bedrock. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Henneke soil is shallow and somewhat excessively drained. It formed in material weathered from serpentinitic rock. Typically, 50 percent of the surface is covered with a pavement of stones, cobbles, and pebbles. The surface layer is reddish brown gravelly loam 3 inches thick. The upper 8 inches of the subsoil is reddish brown gravelly clay loam, and the lower 8 inches is dark reddish brown very gravelly clay. Fractured serpentinite is at a depth of 19 inches.

Permeability of the Henneke soil is moderately slow. Available water capacity is 1 inch to 2 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate. Calcium to magnesium ratio is less than 1.

The Montara soil is shallow and well drained. It formed in material weathered from serpentinitic rock. Typically, the soil is grayish brown clay loam 12 inches thick over hard, fractured serpentinite.

Permeability of the Montara soil is moderately slow. Available water capacity is 1 inch to 4 inches. Effective rooting depth is 8 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate. Calcium to magnesium ratio is less than 1.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development.

The natural vegetation on this unit is mainly brush because of the limited soil depth, restricted available water capacity, nutrient imbalances, and climate. The vegetation in most areas is mainly chamise, manzanita, buckbrush, and scattered Digger pine. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

If this unit is used for homesite development, the main limitation is depth to bedrock and the moderately slow permeability. Cuts needed to provide building sites can expose bedrock. Shallow depth to bedrock is a major limitation for septic tank absorption fields. The limitations of shallow depth and moderately slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIIs (15), nonirrigated.

142—Henneke-Montara-Rock outcrop complex, 15 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush, scattered conifers, and sparse annual grasses. Elevation is 640 to 3,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 40 percent Henneke gravelly loam, 30 percent Montara clay loam, and 15 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Dubakella, Maxwell, Millsholm, and Okiota soils. Also included are small areas of clayey soils that are 20 to 40 inches deep to bedrock, clayey soils that develop deep wide cracks when dry and are 20 to 40 inches deep to bedrock, Henneke and Montara soils that have slopes of 50 to 75 percent, and soils that are similar to the Henneke and Montara soils but are 20 to 40 inches deep to bedrock or are cooler. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Henneke soil is shallow and somewhat excessively drained. It formed in material weathered from serpentinitic rock. Typically, about 50 percent of the surface is covered with a pavement of stones, cobbles, and pebbles. The surface layer is reddish brown gravelly loam 3 inches thick. The upper 8 inches of the subsoil is reddish brown gravelly clay loam, and the lower 8 inches

is dark reddish brown very gravelly clay. Fractured serpentinite is at a depth of 19 inches.

Permeability of the Henneke soil is moderately slow. Available water capacity is 1 inch to 2 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe. Calcium to magnesium ratio is less than 1.

The Montara soil is shallow and well drained. It formed in material weathered from serpentinitic rock. Typically, the soil is grayish brown clay loam 12 inches thick over hard, fractured serpentinite.

Permeability of the Montara soil is moderately slow. Available water capacity is 1 inch to 4 inches. Effective rooting depth is 8 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe. Calcium to magnesium ratio is less than 1.

Rock outcrop consists of hard, fractured serpentinitic rock. It occurs as small masses of intruding bedrock or as detached stones and boulders on the land surface. Areas of Rock outcrop are 50 feet to 1 acre in size.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush because of the limited soil depth and the restricted available water capacity. The vegetation in most areas is mainly chamise, manzanita, buckbrush, and Digger pine. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

This map unit is in capability subclass VIIs (15), nonirrigated.

143—Henneke-Okiota complex, 30 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush and a few conifers with an understory of sparse annual grasses. Elevation is 1,100 to 3,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 50 percent Henneke gravelly loam and 30 percent Okiota very gravelly clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Henneke and Okiota soils that have slopes of less than 30 percent. Also included are small areas of soils that are similar to the Henneke and Okiota soils but are eroded to a depth of less than 10 inches; soils that are similar to the Okiota soil but are 20 to 40 inches deep to bedrock; and soils that are similar to the Okiota soil but are on north-facing slopes, support dense stands of cypress, and are cooler. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Henneke soil is shallow and somewhat excessively drained. It formed in material weathered from serpentinitic rock. Typically, 55 percent of the surface is covered with a pavement consisting of 15 percent cobbles and stones and 40 percent pebbles. The surface layer is reddish brown gravelly loam 3 inches thick. The upper 8 inches of the subsoil is reddish brown gravelly clay loam, and the lower 8 inches is dark reddish brown very gravelly clay. Serpentinite is at a depth of 19 inches. In some areas the surface layer is very cobbly clay loam.

Permeability of the Henneke soil is moderately slow. Available water capacity is 1 inch to 2 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe. Calcium to magnesium ratio is less than 1.

The Okiota soil is shallow and well drained. It formed in material weathered from serpentinitic rock. Typically, 35 percent of the surface is covered with a pavement consisting of 5 percent cobbles and 30 percent pebbles. The upper part of the surface layer is dark reddish brown very gravelly clay loam 1 inch thick, and the lower part is reddish brown clay loam 2 inches thick. The subsoil is dark reddish brown clay 11 inches thick. Hard, fractured serpentinite is at a depth of 14 inches. Depth to bedrock ranges from 10 to 20 inches. In some areas the surface layer is gravelly clay loam or clay loam. In a few areas 20 to 40 percent of the surface is covered with cobbles and stones.

Permeability of the Okiota soil is slow. Available water capacity is 1.5 to 3.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe. Calcium to magnesium ratio is less than 1. The shrink-swell potential is high.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush because of the limited soil depth, restricted available water capacity, nutrient imbalances, and climate. The vegetation in most areas is mainly chamise, manzanita, scrub oak, and scattered Digger pine. Properly planned and prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

This map unit is in capability subclass VIIs (15), nonirrigated.

144—Jafa loam, 2 to 5 percent slopes. This very deep, well drained soil is on terraces and fans. It formed in alluvium derived from mixed sources. The vegetation is mainly conifers with an understory of brush, grasses, and forbs. Elevation is 800 to 2,200 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is 54 to 58 degrees F, and the average frost-free period is 150 to 190 days.

Typically, the upper part of the surface layer is pale brown loam 8 inches thick and the lower part is light

brown loam 8 inches thick. The upper 16 inches of the subsoil is brown clay loam, the next 8 inches is reddish yellow clay loam, and the lower 28 inches is yellowish red clay loam. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Speaker soils and small areas of somewhat poorly drained soils that have a gravelly substratum and a seasonal high water table and are in the Middletown area, near Dry Creek Cutoff. Also included are small areas of soils that are similar to this Jafa soil but have a clayey subsoil, have less clay in the subsoil, have a gravelly and cobbly subsoil, or have a warmer average annual temperature and are in areas of this unit that have been cleared. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Jafa soil is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight.

This unit is used mainly for timber production. It is also used for homesite development. Areas that have been cleared are also used for livestock grazing, orchards, vineyards, and hay and pasture.

Ponderosa pine, Douglas-fir, and California black oak are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine and 122 for Douglas-fir. The potential annual production of ponderosa pine is 550 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are Oregon white oak, Pacific madrone, sugar pine, and knobcone pine.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit.

Seedling mortality is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir frequently occurs. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. The high soil temperature during the growing season can cause mortality of seedlings.

Among the common forest understory plants are poison-oak, whiteleaf manzanita, greenleaf manzanita, and iris.

This unit can produce a good stand of forage plants by adjusting the overstory of trees and shrubs. The production of forage is limited by a tendency to produce woody species. The soil in this unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Buckbrush, manzanita, and poison-oak provide food and cover for deer, rabbits, quail, and other wildlife. Deferred grazing is needed to reestablish trees. Among the common understory plants suitable for use as forage are soft chess, filaree, and blue wildrye.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. If it is used for septic tank absorption fields, the limitation of moderately slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The main crops grown on this unit are wine grapes and walnuts. Where water is available, irrigation is used for maximum production of these crops. Because of the moderately slow permeability, the application of water should be regulated so that water does not stand on the surface for long periods of time and damage the crops.

This unit is well suited to hay and pasture.

This map unit is in capability units IIe-1 (5), irrigated, and IIIe-1 (5), nonirrigated.

145—Jafa loam, 5 to 15 percent slopes. This very deep, well drained soil is on terraces and fans. It formed in alluvium derived from mixed sources. The vegetation is mainly conifers with an understory of brush, grass, and forbs. Elevation is 800 to 2,200 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is 54 to 58 degrees F, and the average frost-free period is 150 to 190 days.

Typically, the upper part of the surface layer is pale brown loam 8 inches thick and the lower part is light brown loam 8 inches thick. The upper 16 inches of the subsoil is brown clay loam, the next 8 inches is reddish yellow clay loam, and the lower 28 inches is yellowish red clay loam. In some areas the surface layer is fine sandy loam.

Included in this unit are small areas of Speaker soils. Also included are small areas of soils that are similar to this Jafa soil but have a clayey subsoil, have less clay in the subsoil, have a gravelly and cobbly subsoil, or have a warmer average annual soil temperature and are in areas of this unit that have been cleared. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Jafa soil is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for timber production. It is also used for homesite development. Areas that have been cleared are used for livestock grazing and for hay and pasture.

Ponderosa pine, Douglas-fir, and California black oak are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index is 118 for

ponderosa pine and 122 for Douglas-fir. The potential annual production of ponderosa pine is 550 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are Oregon white oak, Pacific madrone, sugar pine, and knobcone pine.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil in this unit is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit.

Seedling mortality is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir frequently occurs. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. The high soil temperature during the growing season can cause mortality of seedlings, especially on the south- and southwest-facing slopes.

Among the common forest understory plants are poison-oak, whiteleaf manzanita, greenleaf manzanita, and iris.

This unit can produce a good stand of forage plants if the overstory of trees and shrubs is adjusted. The production of forage is limited by a tendency of the soils to produce woody species. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Buckbrush, manzanita, and poison-oak provide food and cover for deer, rabbits, quail, and other wildlife. Deferred grazing is needed to reestablish trees. Among the common understory plants suitable for use as forage are soft chess, filaree, and blue wildrye.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. If it is used for septic tank absorption fields, the limitation of moderately slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

If this unit is used for hay and pasture, the main limitation is the hazard of erosion. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

This map unit is in capability unit IIIe-1 (5), irrigated and nonirrigated.

146—Jafa complex, 5 to 30 percent slopes. This map unit is on dissected terraces. The vegetation is mainly mixed conifers and hardwoods, but there are some areas of brush on south-facing slopes. Elevation is 1,800 to 2,700 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 150 to 180 days.

This unit is about 45 percent Jafa loam and 30 percent Jafa gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Sanhedrin and Speaker soils. Also included are small areas of soils that are similar to these Jafa soils but have more than 35 percent rock fragments throughout the profile or have been eroded, or both. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Jafa loam is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface is covered with a mat of leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown loam 6 inches thick, and the lower part is light brown gravelly loam 7 inches thick. The upper 12 inches of the subsoil is reddish yellow gravelly loam, and the lower 60 inches is reddish yellow gravelly clay loam.

Permeability of the Jafa loam is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Jafa gravelly loam is very deep and well drained. It formed in alluvium derived from mixed sources. Typically, the surface is covered with a mat of leaves and grass 0.5 inch thick. The upper part of the surface layer is brown gravelly loam 10 inches thick, and the lower part is light brown gravelly loam 7 inches thick. The upper 7 inches of the subsoil is reddish yellow gravelly loam, the next 15 inches is reddish yellow gravelly clay loam, and the lower 50 inches is reddish yellow very gravelly clay loam.

Permeability of the Jafa gravelly loam is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for timber production and wildlife habitat. It is also used for homesite development.

Ponderosa pine, Douglas-fir, and California black oak are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index is 118 for ponderosa pine and 122 for Douglas-fir. The potential annual production of ponderosa pine is 550 board feet per acre from a fully stocked stand of trees.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are slippery when wet, and they

may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine or Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs. Among the common forest understory plants are poison-oak and bedstraw.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and the moderately slow permeability. Because of the steepness of slope, cutting and filling generally are required to provide level building sites. Cut and fill slopes are susceptible to erosion. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitation of moderately slow permeability can be overcome by increasing the size of the absorption field or by using a specially designed sewage disposal system. In some areas contrasting soil layers cause shallow rooting of trees. Occasional high winds can blow down these trees, resulting in damage to homes and other structures.

This map unit is in capability unit IVe-1 (5), nonirrigated.

147—Kelsey fine sandy loam. This very deep, well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and scattered oaks. Elevation is 900 to 1,600 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is brown fine sandy loam 11 inches thick. The underlying material to a depth of 60 inches is stratified, brown and pale brown very fine sandy loam, fine sandy loam, and sandy loam. In some areas the surface layer is sandy loam.

Included in this unit are small areas of Cole, Maywood Variant, Still, and Talmage soils and small areas of Riverwash and Xerofluvents. Also included are soils that are similar to this Kelsey soil but have a thicker, dark colored surface layer, are in the Collayomi Valley and have average annual precipitation of 40 to 50 inches, or have thin layers of clay, gravel, or sand below a depth of 40 inches. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Kelsey soil is moderately rapid. Available water capacity is 7.0 to 8.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. This soil is subject to rare periods of flooding during prolonged, high-intensity storms.

This unit is used mainly for hay and pasture, orchards, and vineyards. It is also used for livestock grazing and homesite development.

This unit is well suited to hay and pasture.

The main crops grown on this unit are pears, walnuts, and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitation is the hazard of flooding. Capital improvements on this unit should be designed to withstand flooding.

The soil in this unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. To reduce erosion, fences should be used to keep livestock away from streambanks. If the plant cover is disturbed, protection from flooding is needed to control gullying, streambank cutting, and sheet erosion. The characteristic plant community on this unit is mainly wild oat, soft chess, and filaree.

If this unit is used for homesite development, the main limitation is the hazard of flooding. Some low areas near stream channels are flooded during prolonged, high-intensity winter storms. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability units IIs-2 (14), irrigated, and IIIs-2 (14), nonirrigated.

148—Kidd-Forward complex, 5 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush and scattered conifers on the Kidd soil and hardwoods and conifers with an understory of shrubs on the Forward soil. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 51 to 55 degrees F, and the average frost-free period is 150 to 185 days.

This unit is about 60 percent Kidd gravelly loam and 20 percent Forward loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken soils and Rock outcrop. The areas of Rock outcrop occur as escarpments. Also included are small areas of Forward and Kidd soils that have slopes of more than 30 percent; soils that are similar to the Forward soil but have a clayey subsoil; soils that are similar to the Forward and Kidd soils, near Kelseyville and Clearlake Highlands, but have warmer soil temperatures, are sandy loam or loamy sand throughout the profile, and have rapid permeability; and soils that are more than 60 inches deep. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Kidd soil is shallow and somewhat excessively drained. It formed in material weathered from rhyolitic

tuff. Typically, the surface layer is light gray gravelly loam 9 inches thick. The subsoil is very pale brown gravelly loam 7 inches thick. Rhyolitic tuff is at a depth of 16 inches.

Permeability of the Kidd soil is moderately rapid. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate.

The Forward soil is moderately deep and well drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is light gray loam 9 inches thick. The subsoil is light gray gravelly loam 16 inches thick. Rhyolitic tuff is at a depth of 25 inches.

Permeability of the Forward soil is moderately rapid. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for firewood production, timber production, and homesite development.

Estimates of the site index and yield for the Kidd soil have not been made because the vegetation is mainly brush.

Ponderosa pine, Douglas-fir, and sugar pine are the main tree species on the Forward soil. On the basis of a 100-year site curve, the mean site index is 102 for ponderosa pine and 97 for Douglas-fir. The potential annual production of ponderosa pine is 390 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine have not been made. Among the trees of limited extent are knobcone pine in areas that have been repeatedly burned, tanoak, California black oak, Pacific madrone, and interior live oak.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Plant competition is a concern in the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting ponderosa pine, sugar pine, or Douglas-fir seedlings on the Forward soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine, sugar pine, and Douglas-fir occurs infrequently. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are whiteleaf manzanita, greenleaf manzanita, coffeeberry, and buckbrush.

If this unit is used for homesite development, the main limitations are steepness of slope and depth to bedrock. Extensive cutting and filling generally are required. Deep cuts can expose bedrock. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. Shallow depth of the Kidd soil is a major limitation for septic tank absorption fields. The limitation of moderate depth of the Forward soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIe (5), nonirrigated.

149—Kidd-Forward complex, 30 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush and scattered conifers on the Kidd soil and hardwoods and conifers with an understory of shrubs on the Forward soil. Elevation is 1,500 to 3,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 51 to 55 degrees F, and the average frost-free period is 150 to 185 days.

This unit is about 45 percent Kidd gravelly loam and 35 percent Forward loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Forward Variant soils. Also included are small areas of Rock outcrop in the form of escarpments, Kidd and Forward soils that have slopes of more than 50 percent, soils that are similar to the Forward soil but are skeletal, and soils that are similar to the Kidd soil but are less than 10 inches deep. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Kidd soil is shallow and somewhat excessively drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is light gray gravelly loam 9 inches thick. The subsoil is very pale brown gravelly loam 7 inches thick. Rhyolitic tuff is at a depth of 16 inches.

Permeability of the Kidd soil is moderately rapid. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Forward soil is moderately deep and well drained. It formed in material weathered from rhyolitic tuff. Typically, the surface layer is light gray loam 9 inches

thick. The subsoil is light gray gravelly loam 16 inches thick. Rhyolitic tuff is at a depth of 25 inches.

Permeability of the Forward soil is moderately rapid. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for production of firewood and timber.

Estimates of the site index and yield for the Kidd soil have not been made because the vegetation is mostly brush.

Ponderosa pine, Douglas-fir, and sugar pine are the main tree species on the Forward soil. On the basis of a 100-year site curve, the mean site index is 102 for ponderosa pine and 97 for Douglas-fir. The potential annual production of ponderosa pine is 390 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for sugar pine have not been made. Among the trees of limited extent are knobcone pine in areas that have been repeatedly burned, tanoak, California black oak, Pacific madrone, and interior live oak.

Some concerns for the harvesting of timber are steepness of slope and hazard of erosion. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable yarding systems. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Plant competition is a concern in the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting ponderosa pine, sugar pine, or Douglas-fir seedlings on the Forward soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine, sugar pine, and Douglas-fir occurs infrequently. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Among the common forest understory plants are whiteleaf manzanita, greenleaf manzanita, coffeeberry, and buckbrush.

This map unit is in capability subclass VIe (5), nonirrigated.

150—Kilaga Variant loam, 0 to 5 percent slopes. This very deep, moderately well drained soil is on alluvial plains and stream terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 1,550 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 61 to 64 degrees F, and the average frost-free period is 170 to 210 days.

Typically, the surface layer is pale brown loam 10 inches thick. The upper 32 inches of the subsoil is grayish brown and light brownish gray clay loam, and the lower 29 inches is light brownish gray, pale brown, and brown clay. In some areas the surface layer is sandy loam or silty clay loam.

Included in this unit are small areas of soils that are similar to the Kilaga Variant soil but have less clay or have a perched high water table at a depth of 18 to 40 inches in winter and early in spring. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Kilaga Variant soil is slow. Available water capacity is 9 to 11 inches. Effective rooting depth is 60 inches or more. Runoff is slow, and the hazard of erosion is slight. A seasonal perched water table is at a depth of 3 to 6 feet.

This unit is used mainly for livestock grazing. It is also used for hay and pasture.

The production of forage is limited by the susceptibility of the soil to compaction when moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. The characteristic plant community on this unit is mainly soft chess, burclover, filaree, and wild oat.

If this unit is used for hay and pasture, the main limitation is the slow permeability. Application of irrigation water should be regulated so that water does not stand on the surface for long periods and damage crops.

This map unit is in capability units IIe-3 (14), irrigated, and IIIe-3 (14), nonirrigated.

151—Konocti-Benridge complex, 50 to 75 percent slopes. This map unit is on hills and mountains. Rock outcroppings and stones 3 to 25 feet in diameter occur at random throughout the unit. The vegetation is mainly brush on south- and east-facing slopes and brush with scattered hardwoods and conifers on north- and west-facing slopes. Elevation is 1,300 to 4,300 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 53 to 59 degrees F, and the average frost-free period is 140 to 200 days.

This unit is about 40 percent Konocti stony loam, 30 percent Konocti cobbly loam, and 15 percent Benridge loam. The components of this unit are so intricately

intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Konocti Variant and Sodabay soils. Also included are small areas of soils that are similar to the Benridge soil but have 35 to 60 percent rock fragments and soils that are similar to the Konocti and Benridge soils but are 40 to 60 inches deep. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Konocti stony loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown stony loam 4 inches thick. The upper 5 inches of the subsoil is brown stony loam, and the lower 19 inches is light reddish brown very stony clay loam. Fractured dacite is at a depth of 28 inches. In some areas the surface layer is very stony loam.

Permeability of the Konocti stony loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Konocti cobbly loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown cobbly loam 8 inches thick. The upper 8 inches of the subsoil is brown stony loam, and the lower 16 inches is light reddish brown very stony loam. The substratum to a depth of 39 inches is reddish yellow very stony loam. Slightly weathered dacite is at a depth of 39 inches.

Permeability of the Konocti cobbly loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Benridge soil is very deep and well drained. It formed in material weathered from volcanic ash, breccia, or tuff. Typically, the surface layer is light brown loam 6 inches thick. The upper 57 inches of the subsoil is yellowish red gravelly clay loam, and the lower 5 inches is yellowish red clay. Weathered breccia is at a depth of 68 inches.

Permeability of the Benridge soil is moderately slow. Available water capacity is 6.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed.

Woody shrubs are the most extensive plants on this unit. The characteristic vegetation is mainly manzanita, chamise, and California scrub oak with scattered areas of knobcone pine. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, improve access, and reduce the risk of fire.

This map unit is in capability subclass VIIs (15), nonirrigated.

152—Konocti-Hambright complex, 5 to 15 percent slopes. This map unit is on hills. The vegetation is oaks, brush, and annual grasses. Rock outcroppings and stones 10 inches to 50 feet in diameter commonly are throughout the unit. Elevation is 1,000 to 2,500 feet. The average annual precipitation is about 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 50 percent Konocti gravelly loam and 20 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken, Collayomi, Guenoc, Konocti Variant, and Sobrante soils and Rock outcrop. Rock outcrop occurs as escarpments. Also included are small areas of Hambright and Konocti soils that have slopes of less than 5 percent, soils that are similar to Hambright and Konocti soils but have stratified welded tuff and clay below the subsoil or have clay loam textures, and soils that are similar to the Konocti soil but are less than 20 inches deep to basalt. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Konocti soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, 10 percent of the surface is covered with cobbles and stones. The surface layer is brown gravelly loam 6 inches thick. Below this is strong brown gravelly loam 4 inches thick. The subsoil is yellowish red very stony clay loam 19 inches thick. Hard basalt is a depth of 29 inches. In some areas the surface layer is loam.

Permeability of the Konocti soil is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown very gravelly loam about 4 inches thick. The subsoil is reddish brown very gravelly loam about 12 inches thick. Fractured basalt is at a depth of 16 inches. In some areas the surface layer is clay loam.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development and livestock grazing.

If this unit is used for homesite development, the main limitations are depth to bedrock in the Konocti and Hambright soils and the moderately slow permeability of the Konocti soil. Another limitation is the presence of stones and boulders. Cuts needed to provide level building sites can expose bedrock, stones, and boulders.

The shallow depth to bedrock in the Hambright soil is a major limitation for septic tank absorption fields. The limitations of moderate depth to bedrock and of moderately slow permeability of the Konocti soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

Erosion is a hazard in the steeper areas. Only the part of the site that is used for construction should be disturbed. The risk of erosion is increased if the soil is left exposed during site development. Revegetating disturbed areas around construction sites helps to control erosion. Access roads should be designed to control surface runoff and help stabilize cut slopes. Plans for homesite development should provide for the preservation of as many trees as possible.

The production of forage is limited by the restricted available water capacity, the stony surface, and a tendency of the soils to produce woody species. Brush clearing, rangeland seeding, and fertilizing to improve forage production generally are not practical. In areas dominated by brush, properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire. Among the common understory plants are manzanita, chamise, soft chess, and filaree.

This map unit is in capability subclass VIIs (15), nonirrigated.

153—Konocti-Hambright complex, 15 to 30 percent slopes. This map unit is on hills. Rock outcroppings and stones 10 inches to 50 feet in diameter are common throughout the unit. The vegetation is mainly oaks, brush, and annual grasses. Elevation is 1,000 to 2,500 feet. The average annual precipitation is about 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 40 percent Konocti gravelly loam and 30 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken, Collayomi, Guenoc, and Neice soils and Rock outcrop. Rock outcrop occurs as escarpments. Also included are small areas of Hambright and Konocti soils that have slopes of 5 to 15 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Konocti soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, 10 percent of the surface is covered with cobbles and stones. The surface layer is brown gravelly loam 6 inches thick. Below this is strong brown gravelly loam 4 inches thick. The subsoil is yellowish red very stony clay loam 19 inches thick. Hard basalt is at a depth of 29 inches.

Permeability of the Konocti soil is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Fractured basalt is at a depth of 16 inches. In some areas the surface layer is clay loam.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development and livestock grazing.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and depth to bedrock in the Konocti and Hambright soils and the moderately slow permeability of the Konocti soil. Another limitation is the presence of stones and boulders. Steepness of slope presents many problems when this unit is used for homesite development. Extensive cutting and filling generally are required. Cuts needed to provide building sites can expose bedrock or stones and boulders. Cut slopes are susceptible to erosion. The risk of erosion is increased if the soil is left exposed during construction. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. Shallow depth to bedrock in the Hambright soil is a major limitation for septic tank absorption fields. The limitations of moderate depth and moderately slow permeability of the Konocti soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The production of forage is limited on this unit by the restricted available water capacity, the stony surface, and the tendency of the soils to produce woody species. Brush clearing, rangeland seeding, and fertilizing to improve forage production on this unit generally are not practical. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire in areas dominated by brush. Among the common understory plants are manzanita, chamise, soft chess, and filaree.

This map unit is in capability subclass VIIs (15), nonirrigated.

154—Konocti-Hambright-Rock outcrop complex, 30 to 75 percent slopes. This map unit is on hills. The

vegetation is mainly brush or annual grasses and oak. Elevation is 1,000 to 2,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 30 percent Konocti gravelly loam, 30 percent Hambright very gravelly loam, and 15 percent Rock outcrop. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Benridge, Konocti Variant, Neice, Sobrante, and Sodabay soils. Also included are small areas of soils that are similar to the Hambright and Konocti soils but are on north-facing slopes that are cooler or are clay loam. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Konocti soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, 10 percent of the surface is covered with cobbles and stones. The surface layer is brown gravelly loam about 6 inches thick. Below this is strong brown gravelly loam 4 inches thick. The subsoil is yellowish red very stony clay loam about 19 inches thick. Basalt is at a depth of 29 inches.

Permeability of the Konocti soil is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown very gravelly loam about 4 inches thick. The subsoil is reddish brown very gravelly loam about 12 inches thick. Fractured basalt is at a depth of 16 inches.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

Rock outcrop consists of unweathered basaltic rock. It occurs as small masses of intruding bedrock or as detached stones and boulders on the land surface and are as much as 50 feet in diameter.

This unit is used mainly as wildlife habitat and watershed. It is also used for livestock grazing.

The production of forage is limited by the restricted available water capacity, the stony surface, and a tendency of the soils to produce woody species. Brush clearing, rangeland seeding, and fertilizing to improve forage production on this unit generally are not practical. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire in areas dominated by brush. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote a uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. Among the common understory plants are manzanita, chamise, soft chess, and filaree.

This map unit is in capability subclass VIIs (15), nonirrigated.

155—Konocti Variant-Konocti-Hambright complex, 2 to 15 percent slopes. This map unit is on hills. The vegetation is mainly oaks, brush, and annual grasses. Elevation is 1,200 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 50 percent Konocti Variant gravelly loam, 20 percent Konocti cobbly loam, and 15 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Benridge, Sobrante, and Sodabay soils and Rock outcrop. Also included are small areas of soils that are similar to the Konocti and Konocti Variant soils but have a clayey subsoil and soils that are similar to the Hambright soil but are clay loam. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Konocti Variant soil is deep and well drained. It formed in material weathered from basalt. Typically, the surface is covered with a mat of partially decomposed oak and manzanita leaves and twigs about 0.5 inch thick. In some areas 5 to 15 percent of the surface is covered with cobbles and stones. The surface layer is yellowish brown gravelly loam 4 inches thick. The upper 18 inches of the subsoil is brown and strong brown very gravelly loam and very gravelly clay loam, and the lower 31 inches is strong brown very cobbly clay loam and light brown very stony clay loam. Olivine basalt is at a depth of 53 inches.

Permeability of the Konocti Variant soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is medium, and the hazard of erosion is slight.

The Konocti soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, 25 percent of the surface is covered with cobbles, stones, and boulders. The surface layer is dark brown cobbly loam 11 inches thick. The subsoil is dark brown very stony clay loam 17 inches thick. Hard, fractured basalt is at a depth of 28 inches.

Permeability of the Konocti soil is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, 20 to 30 percent of the surface is covered with cobbles and stones. The surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Fractured basalt is at a depth of 16 inches.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It is also used for livestock grazing, firewood production, and homesite development.

The production of forage is limited by the restricted available water capacity, the stony surface, and a tendency of the soils to produce woody species. Where trees and brush grow on the Konocti Variant soil, forage production can be increased by harvesting trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on the Konocti Variant soil.

Brush clearing, rangeland seeding, and fertilizing on the Konocti and Hambright soils generally are not practical. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire in areas dominated by brush. Among the common understory plants are manzanita, mountainmahogany, and annual grasses on the Konocti Variant soil and manzanita, chamise, soft chess, and filaree on the Konocti and Hambright soils.

If this unit is used for homesite development, the main limitations are the depth to bedrock in the Konocti and Hambright soils and the moderately slow permeability of the Konocti Variant and Konocti soils. Another limitation is the presence of stones and boulders. Cuts needed to provide building sites on this unit can expose bedrock or stones and boulders. Shallow depth to bedrock in the Hambright soil is a major limitation for septic tank absorption fields. The limitations of moderate depth of the Konocti soil and moderately slow permeability of the Konocti and Konocti Variant soils can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIIs (15), nonirrigated.

156—Konocti Variant-Konocti-Hambright complex, 15 to 30 percent slopes. This map unit is on hills. The vegetation is mainly oaks, brush, and annual grasses. Elevation is 1,200 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 50 percent Konocti Variant gravelly loam, 20 percent Konocti cobbly loam, and 15 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Benridge, Sobrante, and Sodabay soils and Rock outcrop. Also included are small areas of soils that are similar to the Konocti and Konocti Variant soils but have a clayey subsoil and soils that are similar to the Hambright soil but are clay loam. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Konocti Variant soil is deep and well drained. It formed in material weathered from basalt. Typically, the surface is covered with a mat of partially decomposed oak and manzanita leaves and twigs about 0.5 inch thick. In some areas 5 to 15 percent of the surface is covered with cobbles and stones. The surface layer is yellowish brown gravelly loam 4 inches thick. The upper 18 inches of the subsoil is brown and strong brown very gravelly loam and very gravelly clay loam, and the lower 31 inches is strong brown very cobbly clay loam and light brown very stony clay loam. Olivine basalt is at a depth of 53 inches.

Permeability of the Konocti Variant soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Konocti soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, 25 percent of the surface is covered with cobbles, stones, and boulders. The surface layer is dark brown cobbly loam 11 inches thick. The subsoil is dark brown very stony clay loam 17 inches thick. Hard, fractured basalt is at a depth of 28 inches.

Permeability of the Konocti soil is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, 20 to 30 percent of the surface is covered with cobbles and stones. The surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Fractured basalt is at a depth of 16 inches.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It is also used for livestock grazing and firewood production.

The production of forage is limited by the restricted available water capacity, the stony surface, and a tendency of the soils to produce woody species. Where

trees and brush grow on the Konocti Variant soil, forage production can be increased by properly managing the harvesting of trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on the Konocti Variant soil.

Brush clearing, rangeland seeding, and fertilizing on the Konocti and Hambright soils generally are not practical. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire in areas dominated by brush. Among the common understory plants are manzanita, mountainmahogany, and annual grasses on the Konocti Variant soil and manzanita, chamise, soft chess, and filaree on the Konocti and Hambright soils.

This map unit is in capability subclass VIIs (15), nonirrigated.

157—Landlow Variant silty clay loam. This very deep, poorly drained soil is in basins and on flood plains. It formed in alluvium derived from recent lacustrine deposits. Slope is 0 to 2 percent. The vegetation is mainly marshgrasses and other water-tolerant species. Elevation is 1,100 to 1,400 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 170 to 210 days.

Typically, the surface layer is grayish brown silty clay loam 7 inches thick. The subsoil is grayish brown silty clay 16 inches thick. The substratum to a depth of 84 inches is light olive gray, olive gray, and gray silty clay loam. In some areas the surface layer is silt loam.

Included in this unit are small areas of Clear Lake, Cole, and Mocho Variant soils. Also included are small areas of soils, near drainageways, that have a gravelly or cobbly substratum. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Landlow Variant soil is slow. Available water capacity is 8.5 to 10.5 inches. Effective rooting depth is limited by a seasonal high water table that is at a depth of 0.5 to 1.0 foot from December to March. The water table drops to a depth of 4 to 6 feet during the growing season. Surface runoff is slow, and the hazard of erosion is slight. This soil is subject to occasional periods of flooding for 2 to 7 days in winter and spring. The shrink-swell potential is high.

This unit is used mainly for hay and pasture and for wildlife habitat. It is also used for homesite development.

If this unit is used for hay and pasture, the main limitations are slow permeability, poor drainage, and the hazard of flooding. Because of the slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill. Excess water can be removed by installing subsurface drains or drainage ditches if an outlet is available. The risk of flooding can be reduced by the use of dikes and levees.

If this unit is used for homesite development, the main limitations are the hazard of flooding, the seasonal high water table, slow permeability, high shrink-swell potential, and low load bearing capacity. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level. Drainage is needed if roads and building foundations are constructed. This unit is very poorly suited to septic tank absoprtion fields because of the seasonal high water table, the hazard of flooding, and the slow permeability. The high shrink-swell potential of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIw-2 (14), irrigated and nonirrigated.

158—Lupoyoma silt loam, protected. This very deep, moderately well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and scattered oaks. Elevation is 800 to 1,450 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is brown silt loam 31 inches thick. The underlying material to a depth of 84 inches is brown and very dark grayish brown silt loam. In some areas the surface layer is loam.

Included in this unit are small areas of Cole Variant, Kelsey, and Maywood Variant soils and Xerofluvents. Xerofluvents are along drainageways. Also included are soils that are similar to this Lupoyoma soil but are well drained. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Lupoyoma soil is moderately slow. Available water capacity is 8.5 to 11.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. This soil is subject to rare periods of flooding in winter and early in spring. Some areas are not subject to flooding because of the development of flood control structures.

This unit is used mainly for orchards, vineyards, and hay and pasture. It is also used for homesite development.

The main crops grown on the unit are pears, walnuts, and wine grapes (fig. 3). The main limitation is the hazard of flooding. Capital improvements should be designed to withstand flooding.

This unit is well suited to hay and pasture.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and the hazard of flooding. If this unit is used for septic tank absorption fields, increasing the size of the absorption field or using a specially designed sewage disposal system can help to compensate for the moderately slow permeability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability class I (14), irrigated, and capability unit IIIc-1 (14), nonirrigated.

159—Manzanita loam, 2 to 5 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is oaks, manzanita,

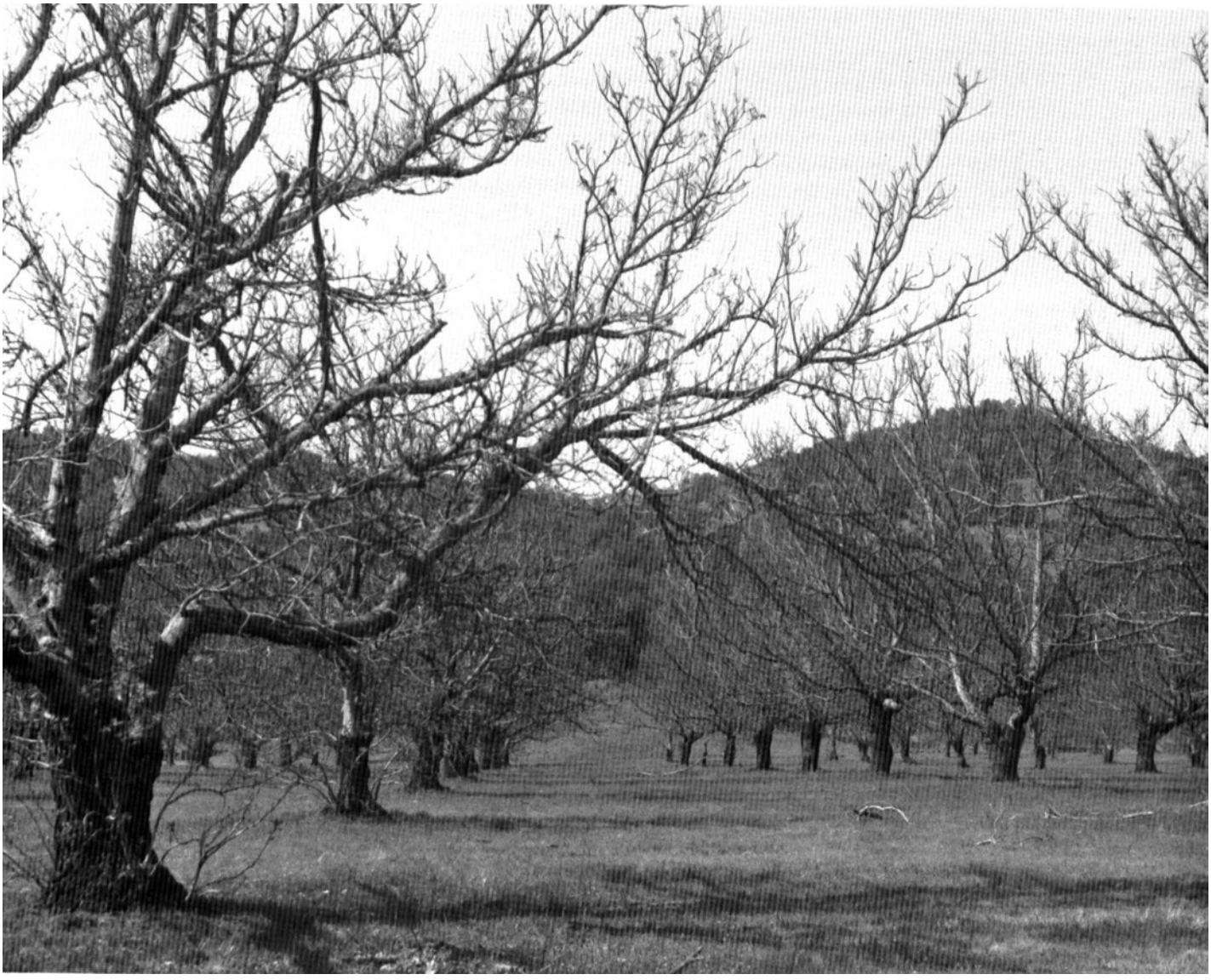

Figure 3.—Nonirrigated walnut orchard in an area of Lupoyoma silt loam, protected, in Middle Creek Valley.

and annual grasses. Elevation is 1,400 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the upper 5 inches of the surface layer is light yellowish brown loam and the lower 14 inches is strong brown loam. The upper 9 inches of the subsoil is strong brown loam, and the lower 56 inches is variegated strong brown and yellowish red clay loam.

Included in this unit are small areas of Forbesville soils. Also included are small areas of soils that are similar to this Manzanita soil but have a gravelly subsoil. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Manzanita soil is slow. Available water capacity is 7.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight.

This unit is used mainly for orchards, hay and pasture, livestock grazing, and homesite development. It is also used for firewood production.

The main crop grown on this unit is walnuts. Where water is available, irrigation is used for maximum production of this crop. The unit has potential for vineyards. The main limitation is the slow permeability. Because of this limitation, irrigation water needs to be applied slowly to minimize runoff.

If this unit is used for hay and pasture, the main limitation is the slow permeability of the soil. Because of this limitation, irrigation water needs to be applied slowly to minimize runoff.

The production of forage is limited by the tendency of the soil in this unit to produce woody species. Where trees and brush are present, forage production can be increased by harvesting trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on this unit. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Among the common understory plants are soft chess, purple needlegrass, and filaree.

If this unit is used for homesite development, the main limitation is the slow permeability of the soil. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability units IIe-3 (14), irrigated, and IIIe-3 (14), nonirrigated.

160—Manzanita loam, 5 to 15 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is oak, manzanita, and annual grasses. Elevation is 1,400 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the upper 5 inches of the surface layer is light yellowish brown loam and the lower 14 inches is strong brown loam. The upper 9 inches of the subsoil is strong brown loam, and the lower 56 inches is variegated strong brown and yellowish red clay loam.

Included in this unit are small areas of Forbesville soils. Also included are small areas of soils that are similar to this Manzanita soil but have a gravelly subsoil. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Manzanita soil is slow. Available water capacity is 7.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used for homesite development, hay and pasture, livestock grazing, and orchards. It is also used for firewood production.

If this unit is used for homesite development, the main limitation is the slow permeability of the soil. If the soil is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

If this unit is used for hay and pasture, the main limitations are the slow permeability of the soil and the hazard of erosion. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

The production of forage is limited by the tendency of the soil in this unit to produce woody species. Where trees and brush are present, forage production can be increased by harvesting trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on this unit. This unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Among the common understory plants are soft chess, purple needlegrass, and filaree.

The main crop grown on this unit is walnuts. This crop commonly is not irrigated because an adequate irrigation water supply has not been developed. This unit has potential for wine grapes. It is limited mainly by the hazard of erosion and steepness of slope. Use of a cover crop between rows of trees or vines helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

This map unit is in capability unit IIIe-1 (14), irrigated and nonirrigated.

161—Manzanita loam, 15 to 25 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation is oak, manzanita, and annual grasses. Elevation is 1,400 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the upper 5 inches of the surface layer is light yellowish brown loam and the lower 14 inches is strong brown loam. The upper 9 inches of the subsoil is strong brown loam, and the lower 56 inches is variegated strong brown and yellowish red clay loam.

Included in this unit are small areas of Forbesville soils. Also included are small areas of Manzanita soils that have slopes of 5 to 15 percent and soils that are similar to this Manzanita soil but have a gravelly subsoil or are on north-facing slopes that are slightly cooler. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Manzanita soil is slow. Available water capacity is 7.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used for homesite development and livestock grazing. It is also used for firewood production.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and slow permeability. Extensive cutting and filling generally are required. Cuts needed to provide building sites can expose the clayey subsoil. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation and revegetating disturbed areas help to control erosion. Slope limits installation of septic tank absoprtion fields. Absorption lines should be installed on the contour. If this unit is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The production of forage is limited by the tendency of this unit to produce woody species. Where trees and brush are present, forage production can be increased by harvesting trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on this unit. The soil in this unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Livestock grazing should be managed to protect the soil from excessive erosion. Among the common understory plants are soft chess, purple needlegrass, and filaree.

This map unit is in capability unit IVe-1 (14), nonirrigated.

162—Manzanita gravelly loam, 2 to 8 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is mainly scattered oaks, manzanita, and annual grasses. Elevation is 1,350 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is brown gravelly loam 7 inches thick. The upper 28 inches of the subsoil is reddish yellow gravelly clay loam, and the lower 25 inches is reddish yellow gravelly clay.

Included in this unit are small areas of Forbesville and Manzanita loams. Also included are small areas of Manzanita soils that have slopes of more than 8 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Manzanita soil is slow. Available water capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of water erosion is moderate.

This unit is used for livestock grazing, homesite development, and orchards. It is also used for hay and pasture and for firewood production.

The production of forage is limited by the tendency of this unit to produce woody species. Where trees and brush are present, forage production can be increased by harvesting trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on this unit. The unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Among the common understory plants are slender oat, soft chess, annual clover, and filaree.

If this unit is used for homesite development, the main limitation is slow permeability. If it is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The main crop grown on this unit is walnuts. This crop commonly is not irrigated because an adequate irrigation water supply has not been developed. This unit has potential for wine grapes. It is limited mainly by the hazard of erosion and by steepness of slope in some areas. Use of a cover crop between rows of trees or vines helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for hay and pasture, the main limitations are slow permeability and the hazard of erosion. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted

grazing during wet periods helps to keep the pasture in good condition and to protect the unit from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

This map unit is in capability units IIe-3 (14), irrigated, and IIIe-3 (14), nonirrigated.

163—Manzanita gravelly loam, 8 to 25 percent slopes. This very deep, well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation is mainly scattered oaks, manzanita, and annual grasses. Elevation is 1,350 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is brown gravelly loam 7 inches thick. The upper 28 inches of the subsoil is reddish yellow gravelly clay loam, and the lower 25 inches is reddish yellow gravelly clay.

Included in this unit are small areas of Forbesville and Manzanita loams and soils that are similar to this Manzanita soil but have slopes of more than 25 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Manzanita soil is slow. Available water capacity is 6 to 9 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used for livestock grazing and homesite development. It is also used for orchards and firewood production.

The production of forage is limited by the tendency of this unit to produce woody species. Where trees and brush are present, forage production will be increased by harvesting trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 25 cords of wood per acre have been measured on this unit. The unit responds well to fertilizer, to rangeland seeding, and to proper grazing use. Among the common understory plants are slender oat, soft chess, annual clover, and filaree.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and slow permeability. Extensive cutting and filling generally are required. Cut slopes are susceptible to excessive erosion, and intensive runoff control measures are needed. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation and revegetating disturbed areas help to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. If this unit is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

The main crop grown on this unit is walnuts. This crop commonly is not irrigated because an adequate irrigation water supply has not been developed. This unit has potential for wine grapes. The hazard of erosion and steepness of slope are major limitations for this use. Use of a cover crop between rows of trees or vines helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

This map unit is in capability unit IVe-1 (14), nonirrigated.

164—Maxwell clay loam, 0 to 2 percent slopes. This very deep, somewhat poorly drained soil is in basins. It formed in alluvium derived dominantly from serpentinitic rock. The vegetation is mainly annual grasses and forbs. Elevation is 800 to 1,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is dark gray clay loam 6 inches thick over gray clay 32 inches thick. The underlying material to a depth of 84 inches is calcareous gray clay. In some areas the upper part of the surface layer is clay.

Included in this unit are small areas of Cole, Mocho Variant, and Yorkville Variant soils. Also included are soils that are similar to this Maxwell soil but have a layer of overwash on the surface, soils that are 20 to 40 inches deep over serpentinitic bedrock, and extremely gravelly soils in drainageways. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Maxwell soil is very slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. A seasonal high water table is at a depth of 42 to 60 inches from December through March. The water table drops to a depth of more than 60 inches during the growing season. The shrink-swell potential is high. The calcium to magnesium ratio is less than 1.

This unit is used mainly for hay and pasture and livestock grazing. It is also used for homesite development.

This unit is poorly suited to hay and pasture. The main limitations are the very slow permeability and low calcium to magnesium ratio. Because of the very slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods of time and damage the crops. Growth of many plants is limited by the low calcium to magnesium ratio; however, overcoming it is not economically feasible because of the large amount of calcium needed.

The production of forage is limited by the low calcium to magnesium ratio and susceptibility of the soil to compaction when moist. Rangeland seeding and fertilizing generally are not practical because of the low calcium to magnesium ratio. Overcoming this limitation is not economically feasible because of the large amount of calcium needed. Grazing should be deferred when the surface layer is saturated. The characteristic plant community on this unit is mainly slender oat, soft chess, and wild oat.

If this unit is used for homesite development, the main limitations are the seasonal high water table, very slow permeability, high shrink-swell potential, and low load bearing capacity. This unit is poorly suited to septic tank absorption fields because of the seasonal high water table and very slow permeability. If the soil in this unit is used for absorption fields, using a specially designed sewage disposal system can help to compensate for these limitations. The high shrink-swell potential of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIw-9 (14), irrigated and nonirrigated.

165—Maxwell clay loam, 2 to 8 percent slopes. This very deep, somewhat poorly drained soil is in basins and on basin rims. It formed in alluvium derived dominantly from serpentinitic rock. The vegetation is mainly annual grasses and forbs. Elevation is 800 to 1,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is dark gray clay loam 6 inches thick over gray clay 32 inches thick. The underlying material to a depth of 84 inches is calcareous gray clay. In some areas the upper part of the surface layer is clay.

Included in this unit are small areas of Henneke, Montara, and Yorkville Variant soils and Rock outcrop. Rock outcrop occurs as escarpments. Also included are small areas of serpentinitic colluvium at the base of some slopes, soils that are 20 to 40 inches deep over serpentinitic bedrock, extremely gravelly and cobbly soils in drainageways, and Maxwell soils that have slopes of 8 to 15 percent. Included areas make up about 40 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Maxwell soil is very slow. Available water capacity is 6.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate. A seasonal high water table fluctuates between depths of 42 and 60 inches in December through March. The water table drops to a depth of more than 60 inches during the growing season. The shrink-swell potential is high. The calcium to magnesium ratio is less than 1.

This unit is used mainly for hay and pasture and livestock grazing. It is also used for homesite development.

This unit is poorly suited to hay and pasture. The main limitations are the very slow permeability, low calcium to magnesium ratio, and the hazard of erosion. Because of the very slow permeability, irrigation water needs to be applied slowly to minimize runoff. Overcoming the limitation of low calcium to magnesium ratio is not economically feasible because of the large amount of calcium needed. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

The production of forage is limited by the low calcium to magnesium ratio and the susceptibility of the soil to compaction when it is moist. Rangeland seeding and fertilizing on this unit generally are not practical because of the calcium to magnesium ratio. Overcoming this limitation is not economically feasible because of the large amount of calcium needed. Grazing should be deferred when the surface layer is saturated. The characteristic plant community on this unit is mainly slender oat, soft chess, and wild oat.

If this unit is used for homesite development, the main limitations are the seasonal high water table, very slow permeability, high shrink-swell potential, and low load bearing capacity. This unit is poorly suited to septic tank absorption fields because of the seasonal high water table and very slow permeability. Using a specially designed sewage disposal system can help to compensate for the very slow permeability and seasonal high water table. The high shrink-swell potential of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIe-9 (14), irrigated and nonirrigated.

166—Maymen-Etsel-Mayacama complex, 15 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush on the Maymen and Etsel soils and hardwoods with scattered conifers on the

Mayacama soils. Elevation is 1,500 to 4,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 135 to 180 days.

This unit is about 40 percent Maymen gravelly loam, 20 percent Etsel gravelly loam, and 20 percent Mayacama very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Henneke, Montara, Neuns, Sanhedrin, Snook, and Speaker soils and Rock outcrop. Sandstone and graywacke rock outcroppings 10 to 60 feet in diameter are on ridgetops and metastable side slopes. Also included are small areas of soils at more than 4,000 feet elevation. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. The soil is very pale brown gravelly loam 3 inches thick over very pale brown very gravelly loam 7 inches thick. Fractured sandstone is at a depth of 10 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Mayacama soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown very gravelly sandy loam 5 inches thick. The subsoil is very pale brown very gravelly sandy clay loam 26 inches thick. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Mayacama soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It is also used for firewood production. Areas that are cleared can be used for livestock grazing.

The natural vegetation on the Maymen and Etsel soils is mainly brush. The species on these soils are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Canyon live oak, California black oak, and Douglas-fir are the main tree species on the Mayacama soil. Among the trees of limited extent are California nutmeg and knobcone pine. Estimates of the site index for this soil have not been made. Volumes of 40 to 90 cords of wood per acre have been measured on the Mayacama soil. There are no major limitations for the harvesting of firewood. Conifer stands commonly are small and widely scattered, making them generally noncommercial.

The production of forage is limited by a dense canopy of woody species. Brush management to increase forage production through type conversion generally is not practical on this unit. If the Maymen soil is cleared for firebreaks, however, seeding grass will provide forage for some livestock grazing and will help to prevent erosion. The Etsel and Mayacama soils cannot support good stands of grasses.

This map unit is in capability subclass VIIs (15), nonirrigated.

167—Maymen-Etsel-Mayacama complex, 30 to 75 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush on the Maymen and Etsel soils and hardwoods with scattered conifers on the Mayacama soil. Elevation is 1,500 to 4,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 52 to 57 degrees F, and the average frost-free period is 135 to 180 days.

This unit is about 35 percent Maymen gravelly loam, 25 percent Etsel gravelly loam, and 20 percent Mayacama very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Henneke, Millsholm, Montara, Neuns, Sanhedrin, Snook, and Speaker soils and Rock outcrop. Sandstone and graywacke rock outcroppings 10 to 60 feet in diameter are on ridgetops and metastable side slopes. Also included are small areas of soils at more than 4,000 feet elevation. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the soil is very pale brown gravelly

loam 3 inches thick over very pale brown very gravelly loam 7 inches thick. Fractured sandstone is at a depth of 10 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Mayacama soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown very gravelly sandy loam 5 inches thick. The subsoil is very pale brown very gravelly sandy clay loam 26 inches thick. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Mayacama soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for firewood production.

The natural vegetation on the Maymen and Etsel soils is mainly brush. The main species are chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Canyon live oak, California black oak, and Douglas-fir are the main tree species on the Mayacama soil. Among the trees of limited extent are California nutmeg and knobcone pine. Estimates of the site index and yield for this soil have not been made. Conifer stands commonly are small and widely scattered, making them generally noncommercial. The main limitations for the harvesting of firewood are steepness of slope and the low volume of commercial species. Because of these limitations, harvesting of trees generally is not economically feasible.

This map unit is in capability subclass VIIs (15), nonirrigated.

168—Maymen-Etsel-Snook complex, 15 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush with some hardwoods and annual grasses. Elevation is 1,500 to 4,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 56 to 57 degrees F, and the average frost-free period is 135 to 185 days.

This unit is about 45 percent Maymen gravelly loam, 15 percent Etsel gravelly loam, and 15 percent Snook loam. Areas of the Snook soil at elevations above 3,500 feet are on south-facing slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Mayacama and Speaker soils and Rock outcrop. Rock outcroppings are on ridgetops and in steep drainageways. Also included are small areas of soils that are similar to the Maymen soil but have a significant clay increase in the subsoil, soils that are similar to Snook soil but have neutral reaction, and soils that are at an elevation of more than 4,000 feet or less than 1,500 feet. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the soil is light yellowish brown gravelly loam 3 inches thick over light yellowish brown very gravelly loam 5 inches thick. Sandstone is at a depth of 8 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Snook soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the soil is light yellowish brown loam 5 inches thick. Fractured sandstone is at a depth of 5 inches.

Permeability of the Snook soil is moderate. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 4 to 10 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Brush management to increase forage production through type conversion generally is not practical. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, improve access, and reduce the risk of fire. Constructing firebreaks on ridgetops helps to prevent wildfire, which results in erosion. Where the Maymen soil is cleared for firebreaks, seeding grass reduces erosion. The Etsel soil will not support good stands of grass.

This map unit is in capability subclass VIIs (15), nonirrigated.

169—Maymen-Etsel-Snook complex, 30 to 75 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush with some hardwoods and annual grasses. Elevation is 1,500 to 4,000 feet. The average annual precipitation is 30 to 50 inches, the

average annual air temperature is 56 to 57 degrees F, and the average frost-free period is 135 to 185 days.

This unit is about 35 percent Maymen gravelly loam, 20 percent Etsel gravelly loam, and 20 percent Snook loam. Areas of the Snook soil at elevations above 3,500 feet are on south-facing slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bressa, Hopland, Mayacama, Millsholm, Neuns, and Speaker soils, Rock outcrop, and soils that are covered with stones. Rock outcroppings and stones 6 inches to 6 feet in diameter are on higher side slopes and ridgetops. Also included are small areas of soils that are similar to the Snook soil but have neutral reaction; small areas of soils that are at an elevation of more than 4,000 feet; and, in an area 2 to 10 miles east of Lower Lake, particularly near Brushy Skyhigh, shallow and moderately deep soils that have a clayey subsoil. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the soil is light yellowish brown gravelly loam 3 inches thick over light yellowish brown very gravelly loam 5 inches thick. Sandstone is at a depth of 8 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Snook soil is shallow and somewhat excessively drained. If formed in material weathered from sandstone or shale. Typically, the soil is light yellowish brown loam 5 inches thick. Fractured sandstone is at a depth of 5 inches.

Permeability of the Snook soil is moderate. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 4 to 10 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire. Constructing firebreaks or ridgetops helps to prevent wildfire, which results in erosion. Where the Maymen soil is cleared for firebreaks, seeding grass reduces erosion. The Etsel soil will not support good stands of grass.

This map unit is in capability subclass VIIs (15), nonirrigated.

170—Maymen-Etsel-Speaker association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly brush on the Maymen and Etsel soils and mixed conifers and hardwoods on the Speaker soil. Elevation is 2,000 to 4,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 35 percent Maymen gravelly loam, 30 percent Etsel very gravelly loam, and 20 percent Speaker gravelly loam. The Speaker soil is on north- and east-facing slopes, and the Maymen and Etsel soils are on ridgetops and on south- and west-facing slopes.

Included in this unit are small areas of Marpa, Neuns, and Sanhedrin soils and Rock outcrop. Rock outcrop is on ridgetops and in steep drainageways. Also included are small areas of soils that are at an elevation of more than 4,000 feet and soils that have slopes of 15 to 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the soil is very pale brown gravelly loam 3 inches thick over very pale brown gravelly loam 7 inches thick. Fractured sandstone is at a depth of 10 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for timber production.

The natural vegetation on the Maymen and Etsel soils is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Speaker soil. Among the trees of limited extent are Pacific madrone and knobcone pine. Some areas are dominated by knobcone pine because of past fires. On the basis of a 100-year site curve, the mean site index is 107 for Douglas-fir and 106 for ponderosa pine. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. Conifer stands commonly are small and widely scattered, making them generally noncommercial.

Some concerns for the harvesting of timber are steepness of slope and seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings on the Speaker soil. If seed trees are present, natural reforestation of cutover areas by Douglas-fir and ponderosa pine occurs periodically. The high soil temperature and low content of soil moisture during the growing season result in a high mortality rate for Douglas-fir, especially on the south- and southwest-facing slopes. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit.

Among the common forest understory plants on the Speaker soil are poison-oak, perennial fescue, and bedstraw.

The Maymen soil is in capability subclass VIIe (15), nonirrigated; the Etsel soil is in capability subclass VIIs (15), nonirrigated; and the Speaker soil is in capability subclass VIe (5), nonirrigated.

171—Maymen-Hopland-Etsel association, 15 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly brush on the Maymen and Etsel soils and hardwoods on the Hopland soil. Elevation is 1,500 to 3,200 feet. The average annual precipitation is 30 to 45 inches, the average annual air temperature is 54 to 57 degrees F, and the average frost-free period is 145 to 185 days.

This unit is about 30 percent Maymen gravelly loam, 30 percent Hopland loam, and 20 percent Etsel gravelly loam. The Maymen and Etsel soils are on ridgetops and on south- and west-facing slopes. The Hopland soil is on north- and east-facing slopes and in ravines.

Included in this unit are small areas of Henneke, Mayacama, Millsholm, Montara, Sanhedrin, Snook, and Speaker soils and Rock outcrop. Also included are small areas of soils that are similar to the Etsel soil but have a thermic temperature where they occur above 2,000 feet elevation. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 6 inches thick. The upper 9 inches of the subsoil is brown loam, and the lower 19 inches is light brown clay loam. Soft, highly weathered sandstone is at a depth of 34 inches.

Permeability of the Hopland soil is moderately slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is very pale brown gravelly loam 3 inches thick. The subsoil is very pale brown very gravelly loam 7 inches thick. Fractured sandstone is at a depth of 10 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for firewood production.

The natural vegetation on the Maymen and Etsel soils is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or

mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

California black oak, Pacific madrone, and interior live oak are the main tree species on the Hopland soil. Volumes of 22 to 94 cords of wood per acre have been measured on this soil.

Some concerns for the harvesting of firewood are seasonal soil wetness and the hazard of erosion. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion. Revegetation of cut and fill slopes is difficult on the Etsel soil because of the restricted available water capacity. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying.

Planting conifers on the Hopland soil is not practical because of the restricted available water capacity and high soil temperature in summer. Hardwoods can regenerate by sprouting after cutting. Regrowth is best if cutting is done in December through May.

Among the common forest understory plants on Hopland soil are poison-oak, scrub oak, and sparse annual forbs.

The Maymen soil is in capability subclass VIIe (15), nonirrigated; the Hopland soil is in capability subclass VIe (5), nonirrigated; and the Etsel soil is in capability subclass VIIs (15), nonirrigated.

172—Maymen-Hopland-Mayacama complex, 9 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly hardwoods with a few conifers and an understory of brush. Elevation is 1,500 to 3,500 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 57 degrees F, and the average frost-free period is 140 to 185 days.

This unit is about 40 percent Maymen gravelly loam, 30 percent Hopland loam, and 15 percent Mayacama very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Mayacama and Maymen soils that have slopes of more than 30 percent or less than 9 percent and soils that are similar to the Maymen soil but have a clay loam subsoil. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 6 inches thick. The upper 9 inches of the subsoil is brown loam, and the lower 19 inches is light brown clay loam. Soft, weathered and fractured sandstone is at a depth of 34 inches.

Permeability of the Hopland soil is moderately slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Mayacama soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown very gravelly sandy loam 5 inches thick. The subsoil is very pale brown very gravelly sandy clay loam 26 inches thick. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Mayacama soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly as wildlife habitat and watershed. It is also used for firewood production.

The natural vegetation on the Maymen soil is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire. Brush control through type conversion to improve forage production generally is not practical. If the Maymen soil is cleared for firebreaks, however, seeding grass provides forage for limited livestock grazing and helps to control erosion.

California black oak, Pacific madrone, and interior live oak are the main tree species on the Hopland and Mayacama soils. Volumes of about 35 cords of wood per acre have been measured on the Hopland soil. Volumes of about 20 cords of wood per acre have been measured on the Mayacama soil. Among the trees of limited extent are Douglas-fir and ponderosa pine.

A concern for the harvesting of firewood is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Rock for construction of roads generally is available on this unit. Conifer plantings on the Hopland and Mayacama soils have a low chance of survival because of the restricted available water capacity and high temperature of the surface layer. After cutting, hardwoods can regenerate by sprouting.

Regrowth is best if cutting is done in December through May.

Among the common forest understory plants are brushy live oak, manzanita, and sparse annual forbs.

This map unit is in capability subclass VIIe (15), nonirrigated.

173—Maymen-Hopland-Mayacama association, 30 to 50 percent slopes. This map unit is on hills and mountains. Rock outcroppings and stones 6 to 25 feet in diameter occur randomly throughout the unit. The vegetation is mainly brush and annual grasses on the Maymen soil and brush and hardwoods with a few conifers on the Hopland and Mayacama soils. Elevation is 1,500 to 3,500 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 57 degrees F, and the average frost-free period is 140 to 185 days.

This unit is about 40 percent Maymen gravelly loam, 20 percent Hopland loam, and 20 percent Mayacama very gravelly sandy loam. The Hopland and Mayacama soils are on north- and east-facing slopes. The Maymen soil is on south- and west-facing slopes and ridgetops.

Included in this unit are small areas of Bressa, Etsel, Henneke, Millsholm, Montara, Sanhedrin, and Speaker soils. Also included are small areas of deep gravelly loam that has more than 40 percent cobbles and stones throughout the profile. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 6 inches thick. The upper 9 inches of the subsoil is brown loam, and the lower 19 inches is light brown clay loam. Soft, highly weathered sandstone is at a depth of 34 inches.

Permeability of the Hopland soil is moderately slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Mayacama soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown very gravelly sandy loam 5 inches thick. The subsoil is very pale brown very gravelly sandy clay loam 26 inches thick. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Mayacama soil is moderate. Available water capacity is 1 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for firewood production.

The natural vegetation on the Maymen soil is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire. Brush control through type conversion to improve forage production generally is not practical. If the Maymen soil is cleared for firebreaks, however, seeding grass will provide forage for limited livestock grazing and will help to control erosion.

California black oak, Pacific madrone, and interior live oak are the main tree species on the Mayacama and Hopland soils. Volumes of about 20 cords of wood per acre have been measured on the Mayacama soil. Volumes of about 35 cords of wood per acre have been measured on the Hopland soil. Among the trees of limited extent are Douglas-fir and California-laurel on the Mayacama soil. Estimates of the yield for Douglas-fir have not been made.

Some concerns for the harvesting of firewood are steepness of slope, seasonal wetness, and the hazard of erosion. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Hopland soil. Revegetation of cut and fill slopes is difficult on the Mayacama soil because of the amount of rock in the soil. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying.

Planting of conifers on the Mayacama and Hopland soils is not practical because of the restricted available water capacity, the high temperature of the surface layer, and the large amount of rock fragments. Hardwoods can regenerate by sprouting after cutting. Regrowth is best if cutting is done in December through May.

Among the common forest understory plants on these soils are California nutmeg, scrub oak, and poison-oak.

The Maymen soil is in capability subclass VIIe (15), nonirrigated; the Hopland soil is in capability subclass VIe (5), nonirrigated; and the Mayacama soil is in capability subclass VIs (5), nonirrigated.

174—Maymen-Hopland-Mayacama association, 50 to 75 percent slopes. This map unit is on hills and mountains. Rock outcroppings and stones 6 to 25 feet in diameter occur randomly throughout the unit. The

vegetation is mainly brush and annual grasses on the Maymen soil and brush and hardwoods with a few conifers on the Hopland and Mayacama soils. Elevation is 1,500 to 3,500 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 53 to 57 degrees F, and the average frost-free period is 140 to 185 days.

This unit is about 40 percent Maymen gravelly loam, 20 percent Hopland loam, and 20 percent Mayacama very gravelly sandy loam. The Hopland and Mayacama soils are on north- and east-facing slopes. The Maymen soil is on south-facing slopes and ridgetops.

Included in this unit are small areas of Bressa, Etsel, Henneke, Montara, Sanhedrin, and Speaker soils. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 6 inches thick. The upper 9 inches of the subsoil is brown loam, and the lower 19 inches is light brown clay loam. Soft, highly weathered sandstone is at a depth of 34 inches.

Permeability of the Hopland soil is moderately slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Mayacama soil is moderately deep and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is pale brown very gravelly sandy loam 5 inches thick. The subsoil is very pale brown very gravelly sandy clay loam 26 inches thick. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Mayacama soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on the Maymen soil is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The natural vegetation on the Hopland and Mayacama soils is mainly hardwood trees and some brush and conifers. California black oak, Pacific madrone, and canyon live oak are the main tree species on these soils. Among the trees of limited extent are Douglas-fir and California-laurel on the Mayacama soil. The harvesting of firewood on these soils generally is not practical because of the steepness of slope.

The Maymen soil is in capability subclass VIIe (15), nonirrigated; the Hopland soil is in capability subclass VIIe (5), nonirrigated; and the Mayacama soil is in capability subclass VIIs (5), nonirrigated.

175—Maymen-Millsholm-Bressa complex, 30 to 50 percent slopes. This map unit is on hills. Rock outcrop and stones 10 inches to 2 feet in diameter are on the upper part of south-facing slopes and on ridgetops. The vegetation is mainly brush and annual grasses on the Maymen soil and oaks and annual grasses on the Millsholm and Bressa soils. Elevation is 1,400 to 3,000 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 55 to 57 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 30 percent Maymen gravelly loam, 20 percent Millsholm loam, and 15 percent Bressa loam. The components of this unit are so intricately intermingled that it was not practical to map separately at the scale used.

Included in this unit are small areas of Etsel, Hopland, Snook, and Squawrock soils. Also included are small areas of soils that are similar to the Millsholm soil but are less than 10 inches deep or have more than 35 percent gravel. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam about 3 inches thick. The subsoil is pale brown clay loam about 8 inches thick. Fractured sandstone is at a depth of 11 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Bressa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray and

pale brown loam about 12 inches thick. The subsoil is light yellowish brown clay loam about 14 inches thick. Fractured sandstone is at a depth of 26 inches.

Permeability of the Bressa soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for livestock grazing and firewood production.

The natural vegetation on the Maymen soil is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The production of forage is limited by a dense canopy cover in some areas and the restricted available water capacity and shallow depth of Millsholm soil. Where blue oak exists, forage production can be increased by managed harvesting of trees on slopes of less than 40 percent. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 13 to 36 cords of wood per acre have been measured on the Bressa soil.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly located salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants on the Millsholm and Bressa soils are soft chess, wild oat, and filaree.

This map unit is in capability subclass VIIe (15), nonirrigated.

176—Maywood Variant sandy loam. This very deep, well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and scattered oaks and willows. Elevation is 1,300 to 1,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is brown sandy loam 10 inches thick. The underlying material to a depth of 64 inches is stratified, light brownish gray and pale brown sandy loam and silt loam.

Included in this unit are small areas of Kelsey and Lupoyoma soils and Xerofluvents. Also included are small areas of soils, in areas adjacent to streams in Scott's Valley, that are similar to this Maywood Variant soil but are somewhat poorly drained. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Maywood Variant soil is moderate. Available water capacity is 5.5 to 8.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. This soil is subject to occasional flooding for periods of 2 to 7 days during prolonged, high-intensity storms.

This unit is used mainly for hay and pasture, orchards, and vineyards.

If this unit is used for hay and pasture, the main limitation is the hazard of flooding. The risk of flooding can be reduced by the use of dikes and levees.

The main crops grown on this unit are pears, walnuts, and wine grapes. Irrigation commonly is used for the maximum production of these crops. The main limitation is the hazard of flooding. Capital improvements on this unit should be designed to withstand flooding.

This map unit is in capability units IIw-2 (14), irrigated, and IIIw-2 (14), nonirrigated.

177—Millsholm-Bressa loams, 30 to 50 percent slopes. This map unit is on hills. The vegetation is mainly annual grasses, oaks, and brush. Elevation is 1,200 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Millsholm loam and 35 percent Bressa loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Etsel, Hopland, Mayacama, Maymen, Skyhigh, Snook, and Squawrock soils. Also included are soils that are similar to the Millsholm soil but have more than 35 percent coarse fragments. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 9 inches thick. The next layer is pale brown clay loam 6 inches thick. The subsoil is pale brown clay loam 3 inches thick. Fractured sandstone is at a depth of 18 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Bressa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray and pale brown loam 12 inches thick. The subsoil is light yellowish brown clay loam 14 inches thick. Fractured sandstone is at a depth of 26 inches.

Permeability of the Bressa soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective

rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It can be used for firewood production.

The production of forage is limited by a dense canopy cover in some areas and by the restricted available water capacity and shallow depth of the Millsholm soil. Where blue oak exists, forage production can be increased by managed harvesting of trees on slopes of less than 40 percent. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 13 to 36 cords of wood per acre have been measured on the Bressa soil. The Bressa soil responds well to fertilizing and rangeland seeding. The main limitations for seeding are steepness of slope and the woody canopy cover.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly located salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants are soft chess, wild oat, and filaree.

This map unit is in capability subclass VIe (15), nonirrigated.

178—Millsholm-Bressa-Hopland association, 30 to 50 percent slopes. This map unit is on hills. The vegetation is mainly brush and annual grasses on the Millsholm and Bressa soils and hardwood trees and annual grasses on the Hopland soil. Elevation is 1,400 to 3,000 feet. The average annual precipitation is 30 to 40 inches. The average annual air temperature in areas of the Millsholm and Bressa soils is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days. The average annual air temperature in areas of the Hopland soil is 54 to 57 degrees F, and the average frost-free period is 155 to 190 days.

This unit is about 35 percent Millsholm loam, 20 percent Bressa loam, and 15 percent Hopland loam. The Hopland soil is on north- and east-facing slopes, and the Millsholm and Bressa soils are on south-facing slopes.

Included in this unit are small areas of Mayacama, Maymen, Pomo, Skyhigh, Snook, Speaker, and Squawrock soils. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 3 inches thick. The subsoil is pale brown clay loam 8 inches thick. Fractured sandstone is at a depth of 11 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Bressa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray and pale brown loam 12 inches thick. The subsoil is light yellowish brown clay loam 14 inches thick. Fractured sandstone is at a depth of 26 inches.

Permeability of the Bressa soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is brown loam 6 inches thick. The upper 9 inches of the subsoil is brown loam, and the lower 19 inches light brown clay loam. Sandstone is at a depth of 34 inches.

Permeability of the Hopland soil is moderately slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for firewood production.

The production of forage is limited by the dense canopy cover in some areas and by restricted available water capacity and shallow depth of the Millsholm soil. The Hopland soil supports sparse stands of plants suitable for grazing. Where blue oak exists, forage production can be increased by managed harvesting of trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 13 to 36 cords of wood per acre have been measured on the Bressa soil, and volumes of 22 to 94 cords per acre are common on the Hopland soil. The Bressa soil responds well to fertilizing and rangeland seeding. The main limitations for seeding are steepness of slope and the woody canopy cover.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants are soft chess, wild oat, and filaree on the Millsholm and Bressa soils and poison-oak and blue wildrye on the Hopland soil.

The Millsholm and Bressa soils are in capability subclass VIe (15), nonirrigated. The Hopland soil is in capability subclass VIe (5), nonirrigated.

179—Millsholm-Squawrock-Pomo complex, 30 to 50 percent slopes. This map unit is on hills and mountains. The Pomo soils are susceptible to slumping.

The vegetation is mainly annual grasses with scattered oaks and brush on the Millsholm and Squawrock soils and annual grasses on the Pomo soil. Elevation is 1,400 to 3,000 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 195 days.

This unit is about 30 percent Millsholm loam, 30 percent Squawrock gravelly loam, and 20 percent Pomo loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bressa, Hopland, Mayacama, Maymen, Skyhigh, and Yorkville soils and Rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 3 inches thick. The subsoil is pale brown clay loam 8 inches thick. Hard, fractured sandstone is at a depth of 11 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Squawrock soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown gravelly loam 8 inches thick. The subsoil is light brownish gray very gravelly clay loam 29 inches thick. Sandstone is at a depth of 37 inches.

Permeability of the Squawrock soil is moderate. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Pomo soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is yellowish brown loam 11 inches thick. The subsoil is yellowish brown and dark yellowish brown gravelly loam 29 inches thick. The substratum is dark yellowish brown very gravelly clay loam 18 inches thick. Fractured, weathered sandstone is at a depth of 58 inches.

Permeability of the Pomo soil is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe. Slopes are unstable if disturbed.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by the restricted available water capacity of the Millsholm and Squawrock soils, by the dense canopy cover in some areas of the Millsholm soil, and by the susceptibility of the Pomo soil to compaction when wet. Where oaks are present on the Millsholm soil, forage production can be increased by managed harvesting of the trees. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. This unit responds well to seeding, fertilizing, and proper grazing use. The main limitations for seeding are steepness of slope and woody species on the Millsholm soil.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly located salt and livestock watering facilities promote uniform distribution of livestock grazing. Springs and seeps are common on this unit. They can be developed as watering facilities for wildlife and to achieve better livestock distribution. Livestock grazing should be managed to protect this unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants on the Millsholm soil are soft chess, filaree, and manzanita. The characteristic plant community on the Squawrock soil is mainly wild oat, soft chess, and filaree and it is wild oat, purple needlegrass, and filaree on the Pomo soil.

This map unit is in capability subclass VIe (15), nonirrigated.

180—Mocho Variant loam. This very deep, well drained soil is on alluvial plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs with scattered oaks. Elevation is 1,000 to 1,600 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the upper part of the surface layer is brown loam 6 inches thick and the lower part is brown clay loam 10 inches thick. The underlying material to a depth of 40 inches is brown clay loam. Below this to a depth of 70 inches is stratified extremely gravelly sandy clay loam and sandy clay loam.

Included in this unit are small areas of Lupoyoma and Still soils and Xerofluvents. Also included are small areas of soils that are similar to this Mocho Variant soil but have a clay substratum between depths of 40 and 60 inches and have a perched water table in winter and spring. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Mocho Variant soil is moderately slow. Available water capacity is 8.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight.

This unit is used mainly for livestock grazing. It is also used for orchards, vineyards, hay and pasture, and homesite development.

The production of forage is limited by the susceptibility of the soil to compaction when wet. Grazing should be

delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. The soil responds well to fertilizing, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess, annual clover, and wild oat.

This unit is well suited to hay and pasture.

The main crops grown on this unit are walnuts, pears, and wine grapes. Irrigation commonly is used for maximum production of these crops.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. Increasing the size of the septic tank absorption fields or using a specially designed sewage disposal system can help to compensate for the moderately slow permeability.

This map unit is in capability class I (14), irrigated, and capability unit IIIc-1 (14), nonirrigated.

181—Neice-Sobrante-Hambright complex, 15 to 30 percent slopes. This map unit is on hills. The vegetation is mainly oaks, brush, and annual grasses. Elevation is 1,500 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 195 days.

This unit is about 40 percent Neice gravelly loam, 15 percent Sobrante loam, and 15 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Millsholm soils. Also included are small areas of soils that are similar to the Neice soil but have less than 35 percent rock fragments in the subsoil or are less than 60 inches deep to bedrock and small areas of Hambright, Neice, and Sobrante soils that have slopes of more than 30 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Neice soil is very deep and well drained. It formed in material weathered from metavolcanic basalt. Typically, the surface layer is yellowish red gravelly loam 11 inches thick. The upper 9 inches of the subsoil is yellowish red gravelly clay loam, and the lower 50 inches is dark red very gravelly clay. In some areas the surface layer is clay loam.

Permeability of the Neice soil is moderately slow. Available water capacity is 5 to 6 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from metavolcanic basalt. Typically, the surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Basalt is at a depth of 38 inches. In some areas the surface layer is clay loam.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hambright soil is shallow and well drained. It formed in material weathered from metavolcanic basalt. Typically, the surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Basalt is at a depth of 16 inches. In some areas the surface layer is clay loam.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, firewood production, wildlife habitat, and watershed. It is also used for homesite development.

The production of forage is limited by a tendency of the soils to produce woody species and the restricted available water capacity of the Hambright soil. If trees and brush are managed to create open areas, this unit can produce a good stand of desirable grasses and forbs. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 9 cords of wood per acre have been measured on the Sobrante and Hambright soils. Among the common understory plants are blue oak, manzanita, and buckbrush on the Neice soil; soft chess, wild oat, and ripgut brome on the Sobrante soil; and soft chess, filaree, and manzanita on the Hambright soil.

If this unit is used for homesite development, the main limitations are steepness of slope and the hazard of erosion. Other limitations are the moderately slow permeability of the Neice soil and depth to bedrock in the Hambright and Sobrante soils. Extensive cutting and filling generally are required. Cuts needed to provide building sites on the Hambright and Sobrante soils can expose bedrock. The risk of erosion is increased if the soil is left exposed during construction. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. Shallow depth to bedrock in the Hambright soil is a major limitation for septic tank absorption fields. The limitations of depth to bedrock in the Sobrante soil and moderately slow permeability of the Neice soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability subclass VIIs (15), nonirrigated.

182—Neice-Sobrante-Hambright complex, 30 to 75 percent slopes. This map unit is on hills. The vegetation

is mainly oaks, brush, and annual grasses. Elevation is 1,500 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 195 days.

This unit is about 40 percent Neice gravelly loam, 15 percent Sobrante loam, and 15 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Millsholm soils and clayey soils that are moderately deep to serpentine. Also included are small areas of soils that are similar to the Neice soil but have less than 35 percent rock fragments or are less than 60 inches deep. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Neice soil is very deep and well drained. It formed in material weathered from metavolcanic basalt. Typically, the surface layer is yellowish red gravelly loam 11 inches thick. The upper 9 inches of the subsoil is yellowish red gravelly clay loam, and the lower 50 inches is dark red very gravelly clay. In some areas the surface layer is clay loam.

Permeability of the Neice soil is moderately slow. Available water capacity is 5 to 6 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from metavolcanic basalt. Typically, the surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Basalt is at a depth of 38 inches. In some areas the surface layer is clay loam.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Hambright soil is shallow and well drained. It formed in material weathered from metavolcanic basalt. Typically, the surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Basalt is at a depth of 16 inches. In some areas the surface layer is clay loam.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

This unit is poorly suited to livestock grazing. The production of forage is limited by steepness of slope, a tendency of the soils to produce woody species, and the restricted available water capacity of the Hambright soil. To control erosion and provide wildlife habitat, woody plants should be retained on this unit. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and proper placement of livestock watering facilities and salt promote good distribution of grazing. Grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce forage. Among the common understory plants are blue oak, manzanita, and buckbrush on the Neice soil; soft chess, wild oat, and ripgut brome on the Sobrante soil; and soft chess, filaree, and manzanita on the Hambright soil.

This map unit is in capability subclass VIIs (15), nonirrigated.

183—Neuns-Bamtush-Deadwood association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and hardwoods on the Neuns and Bamtush soils and shrubs and hardwoods with scattered conifers on the Deadwood soil. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 45 to 60 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 35 percent Neuns gravelly loam, 25 percent Bamtush gravelly loam, and 20 percent Deadwood very gravelly sandy loam. The Neuns and Bamtush soils are on side slopes, toe slopes, and benches. The Deadwood soil is on ridges.

Included in this unit are small areas of Freezeout, Marpa, Sanhedrin, Shortyork Variant, and Yollabolly soils and Rock outcrop. Also included are small areas of soils that are similar to the Neuns soil but have less clay in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1.5 inches thick. The surface layer is brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured metamorphosed sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Bamtush soil is very deep and well drained. It formed in material weathered from sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly

loam 7 inches thick. The upper 10 inches of the subsoil is brown very gravelly loam, and the lower 46 inches is strong brown very gravelly loam.

Permeability of the Bamtush soil is moderate. Available water capacity is 5.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard, fractured sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Neuns and Bamtush soils. Canyon live oak and scattered Douglas-fir and ponderosa pine are the main tree species on the Deadwood soil. Among the trees of limited extent are sugar pine, Pacific madrone, and white fir. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 113 on the Neuns soil, 134 on the Bamtush soil, and 83 on the Deadwood soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Neuns soil, 139 on the Bamtush soil, and 84 on the Deadwood soil. The potential annual production of ponderosa pine on the Neuns soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Bamtush soil is 830 board feet per acre from a fully stocked stand of trees. Estimates of the yield for the Deadwood soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber is steepness of slope. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally disturb the soil less in the steeper areas. Revegetation of cut and fill slopes on this unit is difficult because of the large amount of rock fragments in the soil. Rock for construction of roads generally is available on this unit.

Seedling survival is a concern in the reforestation and production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially in areas of the Neuns and Deadwood soils on south- and southwest-facing slopes. Plantings on the Deadwood soil have a low chance of survival because of the restricted available water capacity. Reforestation of the Neuns and Bamtush soils can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs on the Neuns and Bamtush soils.

Among the common forest understory plants are serviceberry, gooseberry, brackenfern, and perennial fescue.

The Neuns and Bamtush soils are in capability subclass VIe (5), nonirrigated, and the Deadwood soil is in capability subclass VIIe (5), nonirrigated.

184—Neuns-Deadwood-Bamtush association, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and hardwoods on the Neuns and Bamtush soils and brush and hardwoods with scattered confiers on the Deadwood soil. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 45 to 60 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 35 percent Neuns gravelly loam, 25 percent Deadwood very gravelly sandy loam, and 20 percent Bamtush gravelly loam. The Neuns and Bamtush soils are on side slopes, toe slopes, and benches. The Deadwood soil is on ridgetops.

Included in this unit are small areas of Freezeout, Marpa, Shortyork Variant, and Yollabolly soils and Rock outcrop. Also included are small areas of soils that are similar to the Neuns soil but have less clay in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1.5 inches thick. The surface layer is brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured, metamorphosed sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard, fractured sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Bamtush soil is very deep and well drained. It formed in material weathered from sandstone throughout most of the survey area and from greenstone in the Snow Mountain area. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 7 inches thick. The upper 10 inches of the subsoil is brown very gravelly loam, and the lower 46 inches is strong brown very gravelly loam.

Permeability of the Bamtush soil is moderate. Available water capacity is 5.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Neuns and Bamtush soils. Canyon live oak and scattered Douglas-fir and ponderosa pine are the main tree species on the Deadwood soil. Among the trees of limited extent are sugar pine, white fir, and Pacific madrone. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 113 on the Neuns soil, 83 on the Deadwood soil, and 134 on the Bamtush soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Neuns soil, 84 on the Deadwood soil, and 139 on the Bamtush soil. The potential annual production of ponderosa pine on the Neuns soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Bamtush soil is 830 board feet per acre from a fully stocked stand of trees. Estimates of the yield for the Deadwood soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber is steepness of slope. When harvesting timber, steepness of slope limits the use of wheeled and tracked equipment in skidding. Cable yarding systems generally disturb the soil less. Revegetation of cut and fill slopes is difficult on this unit because of the large amount of rock fragments in the soil. Rocks and loose soil material may slide down from roadcuts on this unit, increasing the need for road maintenance. Rock for construction of roads generally is available on this unit.

Seedling survival is a concern in the reforestation and production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially in areas of the Neuns and Deadwood soils on south- and southwest-facing slopes. Plantings on the Deadwood soil have a low chance of survival because of the restricted available water capacity. Movement of loose material on the surface can reduce the seedling survival rate in the steeper areas of this unit.

Reforestation of the Neuns and Bamtush soils can be accomplished by planting ponderosa pine and Douglas-fir seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs on the Neuns and Bamtush soils.

Among the common forest understory plants are brushy live oak, California nutmeg, and scattered annual forbs. Gooseberry and serviceberry are present on the Bamtush soil.

This unit is in capability subclass VIIe (5), nonirrigated.

185—Neuns-Decy-Sanhedrin complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods with some shrubs. Elevation is 2,800 to 5,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 120 to 170 days.

This unit is about 35 percent Neuns gravelly loam, 30 percent Decy gravelly sandy loam, and 15 percent Sanhedrin gravelly loam. The Decy soil occurs at elevations of more than 3,500 feet. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush and Deadwood soils and Rock outcrop. Also included are small areas of Decy, Neuns, and Sanhedrin soils, on Boardman Ridge, that have slopes of 15 to 30 percent, soils that have slopes of more than 50 percent, soils that are similar to the Decy soil but have 20 to 40 percent cobbles in the profile, and soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 1.5 inches thick. The surface layer is light yellowish brown and brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Decy soil is moderately deep and well drained. It formed in material weathered from sandstone and shale. Typically, the surface layer is brown gravelly sandy loam 8 inches thick. The upper 7 inches of the subsoil is brown gravelly sandy loam, and the lower 9 inches is yellowish brown very gravelly sandy loam. Hard sandstone and shale are at a depth of 24 inches.

Permeability of the Decy soil is moderately rapid. Available water capacity is 1.5 to 4.0 inches. Effective

rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, live oak, and California black oak are the main tree species on the Neuns soil. On the basis of a 100-year site curve, the mean site index is 106 for ponderosa pine and 113 for Douglas-fir. The potential annual production of ponderosa pine is 425 board feet per acre from a fully stocked stand of trees.

Ponderosa pine, Douglas-fir, California black oak, and Pacific madrone are the main tree species on the Decy and Sanhedrin soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Decy soil and 116 on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 101 on the Decy soil and 121 on the Sanhedrin soil. The potential annual production of ponderosa pine on the Decy soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are sugar pine, live oak, and white fir.

Some concerns for the harvesting of timber are steepness of slope and the hazard of erosion. Establishing plant cover on steep cut and fill slopes reduces erosion on the Sanhedrin soil. Revegetation of cut and fill slopes is difficult on the Neuns and Decy soils because of the high content of rock and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts on the Neuns and Decy soils and thus increase the need for maintenance on roads. Rock for construction of roads generally is available on this unit. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying on the Sanhedrin soil. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and track equipment or cable yarding systems.

Seedling establishment is a concern in the production of timber on the Neuns and Decy soils. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Plant competition is a concern in the reforestation of the Sanhedrin soil. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings on this unit. If seed trees are present, natural reforestation by conifers frequently occurs on the Sanhedrin soil but is less reliable on the Neuns and Decy soils.

Among the common forest understory plants are perennial fescue, bedstraw, poison-oak, and gooseberry.

This map unit is in capability subclass VIs (5), nonirrigated.

186—Neuns-Sanhedrin-Deadwood complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods with some shrubs. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 110 to 170 days.

This unit is about 40 percent Neuns gravelly loam, 25 percent Sanhedrin gravelly loam, and 15 percent Deadwood very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Marpa, Maymen, Shortyork Variant, and Speaker soils and Rock outcrop. Also included are small areas of Deadwood, Neuns, and Sanhedrin soils that have slopes of less than 30 percent and soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone and metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1.5 inches thick. The surface layer is light yellowish brown and brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil

is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface layer is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, and California black oak are the main tree species in areas where the Neuns soil is on north-facing slopes and at higher elevations. Canyon live oak and California nutmeg are dominant in hot, dry areas of the Neuns soil. On the basis of a 100-year site curve, the mean site index is 113 for Douglas-fir and 106 for ponderosa pine. The potential annual production of ponderosa pine is 425 board feet per acre from a fully stocked stand of trees. Low stocking of the main commercial species generally reduces the yield substantially in the hotter areas.

Douglas-fir, ponderosa pine, sugar pine, and California black oak are the main tree species on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index is 121 for Douglas-fir and 116 for ponderosa pine. The potential annual production of ponderosa pine is 530 board feet per acre from a fully stocked stand of trees.

Canyon live oak is the main tree species on the Deadwood soil. Among the trees of limited extent are ponderosa pine, Douglas-fir, and sugar pine. On the basis of a 100-year site curve, the mean site index is 84 for ponderosa pine. Estimates of the potential annual production on the Deadwood soil have not been made because the conifers commonly are widely scattered.

A concern for the harvesting of timber is steepness of slope. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally disturb the soil less in the steeper areas. Rock for construction of roads is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Sanhedrin soil. Revegetation of cut and fill slopes is difficult on the Neuns and Deadwood soils because of the high content of rock fragments and restricted available water capacity. Rocks and loose soil material may slide down roadcuts on the Neuns and Deadwood soils and thus increase the need for road maintenance.

Seedling survival is a concern in the production of timber on the Neuns and Deadwood soils. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Natural reforestation of cutover areas by Douglas-fir occurs infrequently. Proper site preparation on the Neuns soil is neccessary to replace stands of brush and hardwoods with conifers. Reforestation of the Neuns soil can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. Planting on the Deadwood soil is not practical because of the high content of rocks and the shallow depth of the soil.

Plant competition is a concern in the production of timber on the Sanhedrin soil. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir frequently occurs.

Among the common forest understory plants are wild pea, nutmeg, California fescue, and manzanita.

This map unit is in capability subclass VIIs (5), nonirrigated.

187—Neuns-Sanhedrin-Deadwood complex, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods with some shrubs. Elevation is 3,000 to 5,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 110 to 170 days.

This unit is about 40 percent Neuns gravelly loam, 20 percent Sanhedrin gravelly loam, and 20 percent Deadwood very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Marpa, Maymen, Shortyork Variant, and Speaker soils and Rock outcrop. Also included are small areas of soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone and metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1.5 inches thick. The surface layer is light yellowish brown and brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish

yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper part of the subsoil is light yellowish brown very gravelly sandy loam 5 inches thick, and the lower part is brownish yellow extremely gravelly sandy loam 4 inches thick. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, and California black oak are the main tree species in areas of the Neuns soil on north-facing slopes and at higher elevations. Canyon live oak and California nutmeg are dominant in hot, dry areas of the Neuns soil. On the basis of a 100-year site curve, the mean site index is 113 for Douglas-fir and 106 for ponderosa pine. The potential annual production of ponderosa pine is 425 board feet per acre from a fully stocked stand of trees. Low stocking of the main commercial species generally reduces the yield substantially in the hotter areas.

Douglas-fir, ponderosa pine, sugar pine, and California black oak are the main tree species on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index is 121 for Douglas-fir and 116 for ponderosa pine. The potential annual production of ponderosa pine is 530 board feet per acre from a fully stocked stand of trees.

Canyon live oak is the main tree species on the Deadwood soil. Among the trees of limited extent are ponderosa pine, Douglas-fir, and sugar pine. On the basis of a 100-year site curve, the mean site index is 84 for ponderosa pine. Estimates of the potential annual production on the Deadwood soil have not been made because the conifers commonly are widely scattered.

A concern for the harvesting of timber is steepness of slope, which limits the use of wheeled and tracked equipment in skidding. Cable yarding systems generally disturb the soil less. Establishing plant cover on steep cut and fill slopes reduces erosion on the Sanhedrin soil. Revegetation of cut and fill slopes is difficult on the Neuns and Deadwood soils because of the high content of rock and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts on the Neuns and Deadwood soils and thus increase the need for road maintenance. Rock for construction of roads generally is available on this unit.

Seedling survival is a concern in the production of timber on the Neuns and Deadwood soils. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Movement of loose material on the surface can reduce seedling survival in the steeper areas of the Neuns and Deadwood soils. Natural reforestation of cutover areas by Douglas-fir occurs infrequently on the Deadwood and Neuns soils. Proper site preparation and planting may make it possible to replace stands of brush and hardwoods with conifers. Reforestation of the Neuns soil can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. Planting on the Deadwood soil is not practical because of the high content of rock and the shallow depth of the soil.

Plant competition is a concern in the production of timber on the Sanhedrin soil. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir and ponderosa pine frequently occurs.

Among the common forest understory plants are wild pea, nutmeg, California fescue, and manzanita.

This map unit is in capability subclass VIIs (5), nonirrigated.

188—Neuns-Sanhedrin-Speaker gravelly loams, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 35 percent Neuns gravelly loam, 30 percent Sanhedrin gravelly loam, and 20 percent Speaker gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Kekawaka, and Maymen soils. Also included are Neuns, Sanhedrin, and Speaker soils that have slopes of less than 30 percent and small areas of soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 1.5 inches thick. The surface layer is light yellowish brown and brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, California black oak, and canyon live oak are the main tree species on the Neuns soil. On the basis of a 100-year site curve, the mean site index is 106 for ponderosa pine and 113 for Douglas-fir. The potential annual production of ponderosa pine is 425 board feet per acre from a fully stocked stand of trees.

Ponderosa pine, Douglas-fir, California black oak, and Pacific madrone are the main tree species on the Sanhedrin and Speaker soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 116 on the Sanhedrin soil and 106 on the Speaker soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 121 on the Sanhedrin soil and 107 on the Speaker soil. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees.

Some concerns for the harvesting of timber are steepness of slope, seasonal soil wetness, and the hazard of erosion. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Sanhedrin and Speaker soils. Revegetation of cut and fill slopes is difficult on the Neuns soil because of the high content of rock fragments and restricted available water capacity. Rock and loose soil material may slide down roadcuts on the Neuns soil, increasing the need for maintenance.

Seedling establishment is a concern in the production of timber on the Neuns soil. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on cool aspects and ponderosa pine in other areas. On the Sanhedrin and Speaker soils, plant competition is a concern in the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings. Reforestation of the Sanhedrin and Speaker soils can be accomplished by planting Douglas-fir and ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by Douglas-fir frequently occurs on this unit.

Among the common forest understory plants are wild pea, mountain brome, California fescue, and manzanita.

This map unit is in capability subclass VIs (5), nonirrigated.

189—Neuns-Sheetiron-Deadwood complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers, hardwoods, and shrubs. Elevation is 3,200 to 5,000 feet. The average

annual precipitation is 40 to 60 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 30 percent Neuns gravelly loam, 25 percent Sheetiron gravelly sandy loam, and 15 percent Deadwood very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Freezeout, Marpa, Shortyork Variant, and Yollabolly soils and Rock outcrop. Also included are small areas of Deadwood, Sheetiron, and Neuns soils that have slopes of less than 30 percent and soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone and metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 1.5 inches thick. The surface layer is brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sheetiron soil is moderately deep and well drained. It formed in material weathered from mica-quartz schist. The surface layer is brown gravelly sandy loam 3 inches thick over pale brown very gravelly sandy loam 5 inches thick. The upper 9 inches of the subsoil is pale brown very gravelly sandy loam, and the lower 12 inches is very pale brown extremely gravelly sandy loam. Fractured mica-quartz schist is at a depth of 29 inches.

Permeability of the Sheetiron soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, interior live oak, and California black oak are the main tree species on this unit. Interior live oak is the dominant tree on the Deadwood soil. Among the trees of limited extent are incense-cedar, white fir, and sugar pine. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Neuns soil, 105 on the Sheetiron soil, and 84 on the Deadwood soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 113 on the Neuns soil, 105 on the Sheetiron soil, and 83 on the Deadwood soil. The potential annual production from a fully stocked stand of ponderosa pine is 425 board feet per acre on the Neuns soil and 415 board feet per acre on the Sheetiron soil. Estimates of the potential annual production on the Deadwood soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber on this unit is steepness of slope. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally disturb the soil less in the steeper areas. Revegetation of cut and fill slopes is difficult on this unit because of the high content of rock fragments in the soils and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts in this unit, necessitating increased maintenance on roads. Rock for construction of roads is available, but it is frequently of low quality. The Sheetiron soil is dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Even when seed trees are present, natural reforestation of cutover areas by Douglas-fir, ponderosa pine, white fir, and incense-cedar occurs infrequently on this unit. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir. Planting on the Deadwood soil is not practical because of the high content of rock and restricted available water capacity of the soil.

Among the common forest understory plants are bedstraw, perennial fescue, poison-oak, and nutmeg.

This map unit is in capability subclass VIIs (5), nonirrigated.

190—Neuns-Sheetiron-Deadwood complex, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers, hardwoods, and some shrubs. Elevation is 3,200 to 5,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 47 to 53 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 30 percent Neuns gravelly loam, 20 percent Sheetiron gravelly sandy loam, and 20 percent Deadwood very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are areas of Bamtush, Freezeout, Marpa, and Yollabolly soils and Rock outcrop. Also included are small areas of Neuns soils that have slopes of more than 75 percent, soils that are similar to the Deadwood and Sheetiron soils but have slopes of more than 75 percent, and soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone and metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 1.5 inches thick. The surface layer is brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Sheetiron soil is moderately deep and well drained. It formed in material weathered from mica-quartz schist. The surface layer is brown gravelly sandy loam 3 inches thick over pale brown very gravelly sandy loam 5 inches thick. The upper 9 inches of the subsoil is pale brown very gravelly sandy loam, and the lower 12 inches is very pale brown extremely gravelly sandy loam. Fractured mica-quartz schist is at a depth of 29 inches.

Permeability of the Sheetiron soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine, Douglas-fir, interior live oak, and California black oak are the main tree species on this unit. Interior live oak is the dominant tree on the Deadwood soil. Among the trees of limited extent are incense-cedar, white fir, and sugar pine. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Neuns soil, 105 on the Sheetiron soil, and 84 on the Deadwood soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 113 on the Neuns soil, 105 on the Sheetiron soil, and 83 on the Deadwood soil. The potential annual production from a fully stocked stand of ponderosa pine is 425 board feet per acre on the Neuns soil and 415 board feet per acre on the Sheetiron soil. Estimates of the potential annual production on the Deadwood soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber is steepness of slope. Cable yarding systems generally are used on this unit. Revegetation of cut and fill slopes is difficult on this unit because of the high amount of rocks in the soil and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts on this unit and thus increase the need for maintenance on roads. Rock for construction of roads is available on this unit but generally is of poor quality. The Sheetiron soil is dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Movement of loose surface material can reduce seedling survival on the steeper slopes. Even with seed trees present, natural reforestation of cutover areas by Douglas-fir, ponderosa pine, white fir, and incense-cedar occurs infrequently on the soils in this unit. Reforestation can be accomplished by planting ponderosa pine and Douglas-fir seedlings. Planting on the Deadwood soil is not practical because of the high content of rock fragments and the restricted available water capacity of the soil.

Among the common forest understory plants are bedstraw, perennial fescue, poison-oak, and nutmeg.

This map unit is in capability subclass VIIs (5), nonirrigated.

191—Neuns-Speaker gravelly loams, 15 to 30 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods and some brush. Elevation is 2,200 to 4,500 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 35 percent Neuns gravelly loam and 30 percent Speaker gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Marpa, Maymen, and Sanhedrin soils and Rock outcrop. Also included are small areas of soils that are similar to the Speaker soil but do not have an argillic horizon and soils that are similar to the Neuns soil but have more clay in the subsoil. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 1.5 inches thick. The surface layer is brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir and ponderosa pine are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 113 on the Neuns soil and 107 on the Speaker soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Neuns soil and 106 on the Speaker soil. The potential annual production of ponderosa pine on the Neuns and Speaker soils is 425 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are white fir, sugar pine, California black oak, and Oregon white oak.

A concern for the harvesting of timber is seasonal wetness on the Speaker soil. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails on the Speaker soil are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Speaker soil. Revegetation of cut and fill slopes is difficult on the Neuns soil because of the high content of rock fragments and restricted available water capacity.

Seedling survival is a concern in the production of timber. The droughtiness of the surface layer reduces the survival rate of seedlings, especially in areas of the Neuns soil on south- and southwest-facing slopes. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings on the Speaker soil. Reforestation should be carefully managed to reduce competition from undesirable plants and to provide partial shade for seedlings. Reforestation can be accomplished by planting ponderosa pine seedlings on the hotter aspects and Douglas-fir on the cooler, north aspects. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir occurs periodically.

Among the common forest understory plants are poison-oak, manzanita, bedstraw, and perennial fescue.

This map unit is in capability unit IVs-1 (5), nonirrigated.

192—Okiota-Henneke complex, 5 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush with an understory of sparse annual grasses. Elevation is 1,100 to 3,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 45 percent Okiota very gravelly clay loam and 35 percent Henneke gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Maxwell soils in swales. Also included are small areas of Okiota and Henneke soils that have slopes of less than 5 percent or more than 30 percent, soils that are similar to the Okiota and Henneke soils but are 20 to 40 inches deep to bedrock, and eroded soils that are less than 10 inches deep. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Okiota soil is shallow and well drained. It formed in material weathered from serpentinitic rock. Typically, 35 percent of the surface is covered with rock fragments, of which 5 percent is cobbles and 30 percent is pebbles. The upper part of the surface layer is dark reddish brown very gravelly clay loam 1 inch thick, and the lower part is reddish brown clay loam 2 inches thick. The subsoil is dark reddish brown clay 11 inches thick. Hard, fractured serpentinite is at a depth of 14 inches. In some areas the surface layer is gravelly clay loam or clay loam. In a few areas 15 to 30 percent of the surface is covered with cobbles and stones.

Permeability of the Okiota soil is slow. Available water capacity is 1.5 to 3.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate. Calcium to magnesium ratio is less than 1. The shrink-swell potential is high.

The Henneke soil is shallow and somewhat excessively drained. It formed in material weathered from serpentinitic rock. Typically, the surface has a pavement that is 15 percent cobbles and stones and 40 percent pebbles. The surface layer is reddish brown gravelly loam 3 inches thick. The upper 8 inches of the subsoil is reddish brown gravelly clay loam, and the lower 8 inches

is dark reddish brown very gravelly clay. Hard, fractured serpentinite is at a depth of 19 inches. In some areas the surface layer is very cobbly clay loam.

Permeability of the Henneke soil is moderately slow. Available water capacity is 1 inch to 2 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate. Calcium to magnesium ratio is less than 1.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush because of the limited soil depth, restricted available water capacity, nutrient imbalances, and climate. The vegetation in most areas is mainly chamise, manzanita, and scrub oak. Properly planned and prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

This map unit is in capability subclass VIIs (15), nonirrigated.

193—Okiota-Henneke-Dubakella association, 15 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush on the Okiota and Henneke soils and brush with a few scattered conifers on the Dubakella soil. Rock outcroppings and stones 6 inches to 25 feet in diameter occur randomly throughout the unit. Elevation is 1,100 to 3,500 feet. The average annual precipitation is 25 to 45 inches, the average annual air temperature is 55 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 30 percent Okiota very gravelly clay loam, 25 percent Henneke gravelly loam, and 25 percent Dubakella very gravelly loam. The Dubakella soil is on north-facing slopes, and the Okiota and Henneke soils are on south-facing slopes. Areas of this map unit near Mount St. Helens are dominated by the Dubakella soil. Other areas, especially in the eastern part of the county, are dominated by the Okiota and Henneke soils, with only small areas of the Dubakella soil.

Included in this unit are small areas of Etsel, Mayacama, Maymen, and Montara soils. Also included are small areas of colluvial slopes composed mainly of cobbles, stones, and boulders, Dubakella and Henneke soils and soils that are similar to the Okiota soil but are at elevations of more than 3,500 feet, soils that are similar to the Dubakella soil but are eroded, and Dubakella soils that are in areas that have a warmer average annual temperature. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Okiota soil is shallow and well drained. It formed in material weathered from serpentinitic rock. Typically, there is a surface pavement consisting of 15 percent cobbles and 30 percent pebbles. The upper part of the surface layer is reddish brown very gravelly clay loam 1 inch thick and the lower part is reddish brown clay loam 2 inches thick. The subsoil to a depth of 14 inches is dark reddish brown clay. Hard, fractured serpentinite is at a depth of 14 inches. In some areas the surface layer has been lost through erosion, and the clay subsoil is exposed.

Permeability of the Okiota soil is slow. Available water capacity is 1.5 to 3.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate. Calcium to magnesium ratio is less than 1. The shrink-swell potential is high.

The Henneke soil is shallow and somewhat excessively drained. It formed in material weathered from serpentinitic rock. Typically, there is a surface pavement consisting of about 35 percent stones, cobbles, and pebbles. The surface layer is reddish brown gravelly loam 3 inches thick. The upper 8 inches of the subsoil is reddish brown gravelly clay loam, and the lower 8 inches is dark reddish brown and reddish brown very gravelly clay. Fractured serpentinite is at a depth of 19 inches.

Permeability of the Henneke soil is moderately slow. Available water capacity is 1 inch to 2 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe. Calcium to magnesium ratio is less than 1.

The Dubakella soil is moderately deep and well drained. It formed in material weathered from serpentinite and peridotite. Typically, the surface layer is dark reddish brown very gravelly loam 7 inches thick. The upper 6 inches of the subsoil is reddish brown very gravelly clay loam, and the lower 17 inches is reddish brown very gravelly clay loam. Fractured serpentinite is at a depth of 30 inches.

Permeability of the Dubakella soil is slow. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe. Calcium to magnesium ratio is less than 1:1.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush because of limited soil depth, restricted available water capacity, nutrient imbalances, and climate. The vegetation in most areas is mainly chamise, manzanita, and scrub oak. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The Okiota soil is in capability subclass VIIe (15), nonirrigated; the Henneke soil is in capability subclass VIIs (15), nonirrigated; and the Dubakella soil is in capability subclass VIIs (5), nonirrigated.

194—Oxalis Variant silt loam. This very deep, poorly drained soil is on alluvial plains. It formed in alluvium derived dominantly from volcanic rock. Slope is 0 to 2 percent. The vegetation is mainly annual grasses and forbs. Elevation is 1,300 to 2,600 feet. The average

annual precipitation is 30 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is light brownish gray and gray silt loam 8 inches thick. The subsoil is light gray silty clay loam 9 inches thick. Below this is a buried surface layer of gray silty clay 6 inches thick. The next layer is a buried subsoil of light gray silty clay 47 inches thick. The substratum to a depth of 84 inches or more is white silt loam.

Included in this unit are small areas of Asbill soils and soils that are similar to this Oxalis Variant soil but are well drained because of the deep entrenchment of gullies or are redder in color. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Oxalis Variant soil is slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of erosion is slight. The shrink-swell potential is high in the subsoil.

This unit is used mainly for livestock grazing.

The production of forage is limited by the susceptibility of the soil in this unit to compaction when it is moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. The soil responds well to fertilizing, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess and other annual grasses.

This map unit is in capability units IIs-3 (14), irrigated, and IIIs-3 (14), nonirrigated.

195—Phipps complex, 5 to 15 percent slopes. This map unit is on uplifted and dissected hills. These soils are susceptible to slumping and gullying. The vegetation is mainly annual grasses, oaks, and brush. Elevation is 1,400 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 40 percent Phipps clay loam and 40 percent Phipps loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Forbesville soils, Phipps soils that have slopes of more than 15 percent, and soils that are similar to these Phipps soils but have a gravelly surface layer. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Phipps clay loam is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown clay loam about 7 inches thick. The upper 11 inches of the subsoil is pale brown and light yellowish brown clay loam, and the lower 24 inches is light yellowish brown clay. The substratum to a depth of 60 inches or more is light yellowish brown clay loam.

Permeability of the Phipps clay loam is slow. Available water capacity is 8 to 12 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential is high.

The Phipps loam is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam 6 inches thick. The subsoil is brown gravelly clay loam about 15 inches thick. The substratum to a depth of 73 inches is brown and yellowish brown gravelly and very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam.

Permeability of the Phipps loam is slow. Available water capacity is 6.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover in some areas. Where oaks are present, forage production can be increased by managing the harvesting of trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 5 to 15 cords of wood per acre have been measured on the Phipps soils. This unit reponds well to fertilizing, rangeland seeding, and proper grazing use. The main limitation for seeding is the woody canopy cover. Among the common understory plants are wild oat, soft chess, and filaree.

If this unit is used for homesite development, the main limitations are slow permeability, high shrink-swell potential, and low load bearing capacity. If the unit is used for septic tank absorption fields, the limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed septic system. The shrink-swell potential and low load bearing capacity of the Phipps clay loam should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the Phipps clay loam is used as a base for roads or streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIe-3 (15), nonirrigated.

196—Phipps complex, 15 to 30 percent slopes. This map unit is on uplifted, dissected hills. These soils are susceptible to slumping and gullying. The vegetation is mainly oak and annual grasses. Elevation is 1,100 to

2,000 feet. The average annual precipitation is about 25 to 35 inches, the average annual air temperature is about 55 to 59 degrees F, and the average frost-free period is about 160 to 200 days.

This unit is about 60 percent Phipps clay loam, loamy substratum, and 15 percent Phipps loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bally and Forbesville soils. Also included are small areas of olive gray clayey soils that form deep, wide cracks when dry and are 20 to 40 inches deep over unconsolidated sediment; soils on north-facing slopes that are similar to these Phipps soils but are cooler; highly eroded or gullied soils in steep ravines; and soils that are similar to these Phipps soils but have a thick, dark-colored surface layer, have more clay throughout the profile, or have less clay in the subsoil. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Phipps clay loam is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown clay loam about 7 inches thick. The upper 11 inches of subsoil is pale brown and light yellowish brown clay loam, and the lower 24 inches of the subsoil is yellowish brown clay. The substratum to a depth of 60 inches or more is light yellowish brown clay loam.

Permeability of this Phipps soil is slow. Available water capacity is 8 to 12 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high in the subsoil.

The Phipps loam is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 6 inches thick. The subsoil is brown gravelly clay loam about 15 inches thick. The substratum to a depth of 73 inches is brown and yellowish brown gravelly and very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam.

Permeability of this Phipps soil is slow. Available water capacity is 6.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, firewood production, wildlife habitat, and watershed.

The production of forage is limited by a dense canopy cover in some areas. Where oaks are present, forage production can be increased by managed harvesting of trees. Vegetation in the drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 5 to 15 cords of wood per acre have been measured on the Phipps soils. This unit responds well to fertilizing, rangeland seeding, and proper grazing use. The main limitation for seeding is the woody canopy cover. Among the common understory plants are wild oat, soft chess, and filaree.

This map unit is in capability unit IVe-1 (15).

197—Phipps complex, 30 to 50 percent slopes. This map unit is on uplifted, dissected hills. These soils are susceptible to slumping and gullying. The vegetation is mainly oak and annual grasses. Elevation is 1,100 to 2,000 feet. The average annual precipitation is about 25 to 35 inches, the average annual air temperature is about 55 to 59 degrees F, and the average frost-free period is about 160 to 200 days.

This unit is about 50 percent Phipps clay loam, loamy substratum, and 15 percent Phipps loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bally and Forbesville soils. Also included are small areas of olive gray clayey soils that form deep, wide cracks when dry and are 20 to 40 inches deep over unconsolidated sediment; highly eroded or gullied soils in steep ravines; soils on north-facing slopes that are similar to these Phipps soils but are cooler or have slopes of 50 to 75 percent; and soils that are similar to these Phipps soils but have a thick, dark-colored surface layer, have more clay throughout the profile, or have less clay in the subsoil. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

The Phipps clay loam is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is pale brown clay loam about 7 inches thick. The upper 11 inches of the subsoil is pale brown and light yellowish brown clay loam, and the lower 24 inches is yellowish brown clay. The substratum to a depth of 60 inches or more is light yellowish brown clay loam.

Permeability of this Phipps soil is slow. Available water capacity is 8 to 12 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high in the subsoil.

The Phipps loam is very deep and well drained. It formed in alluvium derived from mixed rock sources. Typically, the surface layer is brown loam about 6 inches thick. The subsoil is brown gravelly clay loam about 15 inches thick. The substratum to a depth of 73 inches is brown and yellowish brown gravelly and very gravelly sandy clay loam. In some areas the surface layer is sandy clay loam.

Permeability of this Phipps soil is slow. Available water capacity is 6.0 to 7.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by a dense canopy cover in some areas and steepness of slope. Because of the instability of the soils, trees should be retained on this unit. This unit responds well to fertilizing, rangeland seeding, and proper grazing use. The main limitations for seeding are steepness of slope and the woody canopy cover. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants are wild oat, soft chess, and filaree.

This map unit is in capability subclass VIe (15).

198—Pomo-Bressa loams, 15 to 50 percent slopes. This map unit is on hills. The Pomo soils are susceptible to slumping. The vegetation is mainly annual grasses and forbs and scattered stands of oak. Elevation is 1,400 to 3,000 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 60 percent Pomo loam and 15 percent Bressa loam. The components of this unit are so intricately intermingled that is was not practical to map them separately at the scale used.

Included in this unit are small areas of Marpa, Millsholm, and Yorkville soils. Also included are small areas of Bressa soils, soils that are similar to the Pomo soil but have slopes of less than 15 percent, and soils that are similar to the Bressa and Pomo soils but are at elevations of more than 3,000 feet. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Pomo soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is yellowish brown loam 11 inches thick. The subsoil is yellowish brown and dark yellowish brown gravelly loam 29 inches thick. The substratum is dark yellowish brown very gravelly clay loam 18 inches thick. Fractured, weathered sandstone is at a depth of 58 inches.

Permeability of the Pomo soil is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Bressa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is light brownish gray and pale brown loam 12 inches thick. The subsoil is light yellowish brown clay loam 14 inches thick. Fractured sandstone is at a depth of 26 inches.

Permeability of the Bressa soil is moderately slow. Available water capacity is 3.0 to 7.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for firewood production.

The production of forage is limited on the Pomo soil by the susceptibility to compaction when wet and on the Bressa soil by a dense canopy cover in some areas. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. Where oaks are present and slopes are less than 40 percent, forage production can be increased by managing the harvesting of trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 13 to 36 cords of wood per acre have been measured on this unit. This unit responds well to fertilizing, rangeland seeding, and proper grazing use. The main limitation for seeding is steepness of slope.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Springs and seeps are common on this unit. They can be developed as watering facilities for wildlife and to achieve better livestock distribution. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. The characteristic plant community on the Pomo soil is mainly soft chess, purple needlegrass, and filaree. Among the common understory plants on the Bressa soil are wild oat, soft chess, and blue wildrye.

This map unit is in capability subclass VIe (15), nonirrigated.

199—Riverwash. This map unit is in active stream channels. Slope is 0 to 5 percent. The vegetation is mainly very sparse annual grasses and forbs and some brush, commonly on banks or sand bars. Elevation is 620 to 2,000 feet. This unit is inundated during periods of waterflow and is subject to constant deposition and removal of material.

Riverwash consists of erratically stratified layers of water deposited sand, gravel, and cobbles. Layers of sandy loam and loamy sand are deposited for short periods but are subject to intermittent scouring and removal. Thickness of the layers varies from 2 to 40 inches. Reaction is neutral or mildly alkaline.

Runoff is very slow to rapid, and the hazard of erosion is slight to very severe, depending on water velocity.

Riverwash is used mainly as wildlife habitat and as a source of sand and gravel. Because it is nearly devoid of vegetation, it is not used for agriculture.

The removal of aggregates can lower the level of the streambeds and widen stream channels. This can undermine structures, lower the water table adjacent to the stream channel, and erode streambanks, thereby increasing sedimentation downstream. Streambanks can be protected against water erosion by use of a suitable structure, riprap, or vegetation. Check dams or buried sills can be used to control the lowering of streambeds. Shallow recharge ponds can be located in areas of adjacent soils to minimize the effects of a lowering ground water table.

This map unit is in capability class VIII (14), nonirrigated.

200—Rock outcrop-Etsel-Snook complex, 50 to 80 percent slopes. This map unit is on hills and mountains. The vegetation is mainly brush and sparse annual grasses. Elevation is 1,400 to 4,000 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 56 to 57 degrees F, and the average frost-free period is 135 to 190 days.

This unit is about 60 percent Rock outcrop, 15 percent Etsel gravelly loam, and 15 percent Snook loam. Areas of the Snook soil at elevations of more than 3,500 feet are on south-facing slopes. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Mayacama, Maymen, and Neuns soils. Also included are small areas of Etsel soils that have slopes of less than 50 percent or are neutral in reaction and small areas of soils that are at an elevation of more than 4,000 feet. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

Rock outcrop consists of exposed areas of hard, unweathered sandstone. It occurs on ridgetops and side slopes as intruding bedrock or as detached masses of rock. Outcroppings are 100 feet in diameter to 5 acres in diameter.

The Etsel soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the soil is light yellowish brown gravelly loam 3 inches thick over light yellowish brown very gravelly loam 5 inches thick. Sandstone is at a depth of 8 inches.

Permeability of the Etsel soil is moderate. Available water capacity is 0.5 inch to 1.5 inches. Effective rooting depth is 6 to 12 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Snook soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the soil is light yellowish brown loam 5 inches thick. Fractured sandstone is at a depth of 5 inches.

Permeability of the Snook soil is moderate. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 4 to 10 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed.

The natural vegetation on this unit is mainly brush. Because of the instability of the Etsel soil, vegetation should be retained for erosion control and to provide wildlife habitat.

This map unit is in capability subclass VIIs (15), nonirrigated.

201—Sanhedrin-Kekawaka-Speaker complex, 15 to 30 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 49 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 35 percent Sanhedrin gravelly loam, 30 percent Kekawaka loam, and 15 percent Speaker gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush and Marpa soils and small areas of Kekawaka, Sanhedrin, and Speaker soils that have slopes of more than 30 percent. Also included, on Long Ridge in the Mendocino National Forest, are areas of Sanhedrin and Kekawaka soils that are severely eroded; small areas of soils that are similar to the Sanhedrin soil but are more than 60 inches deep; and small areas of soils that are similar to the Speaker soil but have a clay subsoil. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Kekawaka soil is very deep and well drained. It formed in material weathered from sandstone and shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, bark, and twigs 3 inches thick. The surface layer is yellowish brown loam 2 inches thick over light yellowish brown loam 7 inches thick. The upper 19 inches of the subsoil is strong brown and

reddish yellow clay loam, the next 14 inches is reddish yellow and strong brown clay, and the lower 26 inches is reddish yellow gravelly clay.

Permeability of the Kekawaka soil is moderately slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, sugar pine, ponderosa pine, California black oak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 121 on the Sanhedrin soil, 154 on the Kekawaka soil, and 107 on the Speaker soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 116 on the Sanhedrin soil, 147 on the Kekawaka soil, and 106 on the Speaker soil. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Kekawaka soil is 945 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. In many areas, the Kekawaka soil has a rather abrupt boundary between the surface layer and the clay subsoil. In those areas, productivity is much lower; the average site index is 106 for Douglas-fir and 113 for ponderosa pine.

A concern for the harvesting of timber is seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Roads are dusty when dry. If the road is to be used heavily, the surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on this unit.

Plant competition is a concern in the reforestation and production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs.

Among the common forest understory plants are bedstraw, rose, manzanita, and annual forbs.

This map unit is in capability unit IVe-1 (5), nonirrigated.

202—Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 2,200 to 4,800 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 49 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 35 percent Sanhedrin gravelly loam, 30 percent Kekawaka loam, and 15 percent Speaker gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Marpa, and Maymen soils. The Maymen soil is on some south-facing, brush-covered slopes. Also included are small areas of Kekawaka, Sanhedrin, and Speaker soils that have slopes of less than 30 percent; soils that are similar to the Speaker soil but have a clay subsoil; soils that are similar to the Sanhedrin soil but are 60 to 80 inches deep; and on Long Ridge in the Mendocino National Forest, Sanhedrin and Kekawaka soils that are severely eroded. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Kekawaka soil is very deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The surface layer is yellowish brown loam 2 inches thick over light yellowish brown loam 7 inches thick. The upper 19 inches of the subsoil is strong brown and reddish yellow clay loam, the next 14 inches is reddish yellow and strong brown clay, and the lower 26 inches is reddish yellow gravelly clay.

Permeability of the Kekawaka soil is moderately slow. Available water capacity is 8 to 10 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed conifer needles, leaves, twigs, and bark 1 inch thick. The surface layer is brown gravelly loam about 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, sugar pine, California black oak, and Pacific madrone are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 121 on the Sanhedrin soil, 154 on the Kekawaka soil, and 107 on the Speaker soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 116 on the Sanhedrin soil, 147 on the Kekawaka soil, and 106 on the Speaker soil. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Kekawaka soil is 945 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. In some areas, the Kekawaka soil has a rather abrupt boundary between the surface layer and the clay subsoil. In those areas, productivity is much lower; the average site index is 106 for Douglas-fir and 113 for ponderosa pine. Among the trees of limited extent are canyon live oak, Oregon white oak, and white fir.

Some concerns for the harvesting of timber are steepness of slope, the hazard of erosion, and seasonal wetness. The Kekawaka soil has a tendency to slump in some areas; however, this is not a consistent trait. It happens more frequently where there is an abrupt boundary between the surface layer and the clay subsoil. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the tree roots. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Roads on this unit are dusty when dry. If the road is to be used heavily, its surface should be treated. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on this unit.

Plant competition is a concern in the reforestation and production of timber on this unit. When openings are made in the canopy, invading brushy plants that are not controlled can prevent the establishment of conifer seedlings. Reforestation can be accomplished by planting Douglas-fir, ponderosa pine, and sugar pine seedlings. If seed trees are present, natural reforestation of cutover areas by conifers frequently occurs.

Among the common forest understory plants are bedstraw, wild rose, manzanita, and annual forbs.

This map unit is in capability subclass VIe (5), nonirrigated.

203—San Joaquin Variant fine sandy loam, 0 to 5 percent slopes. This moderately deep, well drained soil is on alluvial plains and stream terraces. It formed in alluvium derived dominantly from volcanic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 1,300 to 1,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 155 to 205 days.

Typically, the surface layer is light gray fine sandy loam 21 inches thick. The subsoil is light brownish gray clay loam 4 inches thick. The next layer is a silica-cemented hardpan 5 inches thick. The upper 21 inches of the substratum is pale brown sandy loam, and the lower part to a depth of 65 inches is pale brown fine sandy loam. In some areas the surface layer is loam or silty clay loam. Depth to the hardpan is 20 to 40 inches. The hardpan commonly is 3 to 8 inches thick.

Included in this unit are small areas of Wolfcreek soils. Also included are small areas of a yellower soil with hard, brittle calcium carbonate concretions that is saturated with water for long periods of time and small areas of soils that are similar to this San Joaquin Variant soil but are calcareous throughout. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of the San Joaquin Variant soil is very slow. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very slow, and the hazard of erosion is slight.

This unit is used mainly for hay and pasture and homesite development.

If this unit is used for hay and pasture, the main limitations are the hardpan, which restricts rooting depth, and restricted available water capacity. Ripping and shattering the hardpan increases the effective rooting depth. Frequent applications of irrigation water are needed because of the restricted available water capacity.

If this unit is used for homesite development, the main limitations are the hardpan and slow permeability. The hardpan is rippable and therefore is not a serious limitation for most engineering uses. Suitability of the soil for septic tank absorption fields can be improved by ripping the hardpan to increase permeability. Increasing the size of the absorption field or using a specially designed disposal system can help to compensate for the slow permeability.

This map unit is in capability unit IVe-8 (14), irrigated and nonirrigated.

204—Sheetiron-Deadwood association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods and some shrubs. Elevation is 3,500 to 5,200 feet. The average annual precipitation is 45 to 60 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 50 percent Sheetiron gravelly sandy loam and 30 percent Deadwood very gravelly sandy loam. The Sheetiron soil is on north- and east-facing slopes and on benches. The Deadwood soil is on ridgetops, on south- and west-facing slopes, and in drainageways.

Included in this unit are small areas of Bamtush, Freezeout, Neuns, Sanhedrin, and Yollabolly soils and Rock outcrop. Also included are small areas of Deadwood and Sheetiron soils that have slopes of more than 50 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sheetiron soil is moderately deep and well drained. It formed in material weathered from mica-quartz schist. The surface layer is brown gravelly sandy loam 3 inches thick over pale brown very gravelly sandy loam 5 inches thick. The upper 9 inches of the subsoil is pale brown very gravelly sandy loam, and the lower 12 inches is very pale brown extremely gravelly sandy loam. Fractured mica-quartz schist is at a depth of 29 inches.

Permeability of the Sheetiron soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Sheetiron soil. Canyon live oak, incense-cedar, and scattered Douglas-fir and ponderosa pine are the main tree species on the Deadwood soil. Among the trees of limited extent are white fir on some north aspects and sugar pine. On the basis of a 100-year site curve, the mean site index is estimated to be 105 for both Douglas-fir and ponderosa pine on the Sheetiron soil. On the basis of a 100-year site curve, the mean site index is 83 for Douglas-fir and 84 for ponderosa pine on the Deadwood soil. The potential annual production of ponderosa pine on the Sheetiron soil is 425 board feet per acre from a fully stocked stand of trees. Estimates of the potential annual production on the Deadwood soil have not been made because the vegetation is mostly brush.

A concern for the harvesting of timber on this unit is steepness of slope. Wheeled and tracked equipment can be used in the more gently sloping areas, but cable yarding systems generally disturb the soil less in the steeper areas. Revegetation of cut and fill slopes is difficult on the Sheetiron and Deadwood soils because of the high amount of rocks in the soil and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts in this unit, necessitating increased maintenance on roads. Rock for construction of roads is available on this unit but is frequently of low quality. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Even with seed trees present, natural reforestation of cutover areas by conifers occurs infrequently on this unit. Reforestation can be accomplished by planting large seedlings. Planting on the Deadwood soil is not practical because of the high content of rock fragements and the restricted available water capacity of the soil.

Among the common forest understory plants are California nutmeg and greenleaf mananita.

The Sheetiron soil is in capability subclass VIs (5), nonirrigated, and the Deadwood soil is in capability subclass VIIs (5), nonirrigated.

205—Sheetiron-Deadwood association, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods and some shrubs. Elevation is 3,500 to 5,200 feet. The average annual precipitation is 45 to 60 inches, the average annual air temperature is 47 to 52 degrees F, and the average frost-free period is 110 to 160 days.

This unit is about 50 percent Sheetiron gravelly sandy loam and 30 percent Deadwood very gravelly sandy

loam. The Sheetiron soil is on north- and east-facing slopes and on benches. The Deadwood soil is on ridgetops, on south- and west-facing slopes, and in drainageways.

Included in this unit are small areas of Bamtush, Freezeout, Neuns, Sanhedrin, and Yollabolly soils and Rock outcrop. Also included are small areas of Deadwood and Sheetiron soils that have slopes of less than 50 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sheetiron soil is moderately deep and well drained. It formed in material weathered from mica-quartz schist. The surface layer is brown gravelly sandy loam 3 inches thick over pale brown very gravelly sandy loam 5 inches thick. The upper 9 inches of the subsoil is pale brown very gravelly sandy loam, and the lower 12 inches is very pale brown extremely gravelly sandy loam. Fractured mica-quartz schist is at a depth of 29 inches.

Permeability of the Sheetiron soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Deadwood soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and bark 1 inch thick. The surface layer is brown very gravelly sandy loam 4 inches thick. The upper 5 inches of the subsoil is light yellowish brown very gravelly sandy loam, and the lower 4 inches is brownish yellow extremely gravelly sandy loam. Hard sandstone is at a depth of 13 inches.

Permeability of the Deadwood soil is moderately rapid. Available water capacity is 0.5 to 1.0 inch. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir, ponderosa pine, sugar pine, and California black oak are the main tree species on the Sheetiron soil. Canyon live oak, incense-cedar, and scattered Douglas-fir and ponderosa pine are the main tree species on the Deadwood soil. Among the trees of limited extent are white fir on some north aspects and sugar pine. On the basis of a 100-year site curve, the mean site index is estimated to be 105 for both Douglas-fir and ponderosa pine on the Sheetiron soil. On the basis of a 100-year site curve, the mean site index is 84 for ponderosa pine and 83 for Douglas-fir on the Deadwood soil. The potential annual production of ponderosa pine on the Sheetiron soil is 425 board feet per acre from a fully stocked stand of trees. Estimates of the potential annual production of the Deadwood soil have not been made because the vegetation is mostly brush.

The main limitation for the harvesting of timber is steepness of slope. Cable yarding systems generally are used on this unit. Revegetation of cut and fill slopes is difficult on the Sheetiron and Deadwood soils because of the high amount of rock in the soils and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts on the Sheetiron and Deadwood soils, necessitating increased maintenance on roads. Rock for construction of roads is available on this unit but is frequently of low quality. The soils in this unit are dusty when subjected to vehicular use. If the road is to be used heavily, its surface should be treated.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. Movement of loose surface material can reduce seedling survival on the steeper slopes. Even with seed trees present, natural reforestation of cutover areas by conifers occurs infrequently on these soils. Reforestation can be accomplished by planting large seedlings. Planting on the Deadwood soil is not practical because of the high percentage of rock and the very low available water capacity of the soil.

Among the common forest understory plants are California nutmeg and greenleaf manzanita.

This map unit is in capability subclass VIIs (5), nonirrigated.

206—Shortyork Variant-Yorkville-Squawrock association, 15 to 50 percent slopes. This map unit is on mountains. Mass soil movement is common on this unit and occurs as slumps and slides; it usually is associated with springs and seeps or undercutting of a lower portion of the mountain slope. The vegetation is mainly annual grasses and forbs with scattered oaks. Elevation is 2,000 to 4,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 54 to 58 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 35 percent Shortyork Variant gravelly loam, 30 percent Yorkville clay loam, and 15 percent Squawrock gravelly loam. The Shortyork soil is on unstable, convex, grass-covered side slopes; the Yorkville soil is on unstable, concave, grass-covered side slopes; and the Squawrock soil is on stable, convex, grass-covered spur ridges, in drainageways, and in areas surrounding rock outcroppings.

Included in this unit are small areas of Dubakella, Henneke, Neuns, and Yorktree soils and Rock outcrop. Areas of serpentinitic Rock outcrop are near ridges. Also included are small areas of Shortyork, Squawrock, and Yorkville soils that have slopes of less than 15 percent; soils that are similar to the Shortyork Variant, Squawrock, and Yorkville soils but are at elevations of more than 4,000 feet; and areas of wet Shortyork and Yorkville soils that are in depressional areas and swales. Included areas make up about 20 percent of the total

acreage. The percentage varies from one area to another.

The Shortyork Variant soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone and greenstone. Typically, the surface layer is dark grayish brown gravelly loam 9 inches thick. The upper 3 inches of the subsoil is grayish brown very gravelly clay loam, and the lower 20 inches is variegated, brown and light olive brown very gravelly clay. Hard, fractured greenstone and metamorphosed sandstone are at a depth of 32 inches.

Permeability of the Shortyork Variant soil is very slow. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Yorkville soil is very deep and moderately well drained. It formed in material weathered from graywacke, schist, or shale. Typically, the surface layer is dark gray clay loam 3 inches thick. The upper 30 inches of the subsoil is dark gray and gray clay, and the lower 31 inches is gray gravelly clay loam. Hard, fractured schist is at a depth of 64 inches.

Permeability of the Yorkville soil is very slow. Available water capacity is 8.5 to 13.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Squawrock soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown gravelly loam 8 inches thick. The subsoil is light brownish gray very gravelly clay loam 29 inches thick. Hard, fractured sandstone is at a depth of 37 inches.

Permeability of the Squawrock soil is moderate. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by the susceptibility of the Shortyork and Yorkville soils to compaction when wet and by the restricted available water capacity of the Squawrock soil. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. This unit responds well to fertilizing, rangeland seeding, and proper grazing use. The main limitation for seeding is steepness of slope.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly located salt and livestock watering facilities promote uniform distribution of livestock grazing. Springs and seeps are common on the Yorkville soil. They can be developed as a source of water for wildlife and to achieve better distribution of livestock. The characteristic plant community on this unit is mainly soft chess and wild oat.

This map unit is in capability subclass VIe (15), nonirrigated.

207—Skyhigh-Asbill complex, 8 to 15 percent slopes. This map unit is on hills. The vegetation is mainly annual grasses and oaks with scattered shrubs. Elevation is 1,450 to 2,100 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 55 percent Skyhigh loam and 25 percent Asbill clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Millsholm and Sleeper soils. Also included are small areas of soils that are similar to the Skyhigh soil but are cooler and soils that have a light-colored surface layer. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Skyhigh soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 2 inches thick. The upper 6 inches of the subsoil is brown clay loam, and the lower 30 inches is brown, yellowish brown, and strong brown clay. Hard, fractured sandstone is at a depth of 38 inches. In some areas the surface layer is clay loam.

Permeability of the Skyhigh soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential is high.

The Asbill soil is moderately deep and well drained. It formed in material weathered from shale or siltstone. Typically, the surface layer is olive gray clay loam 13 inches thick. The underlying material to a depth of 39 inches is olive gray and light olive gray clay. Soft siltstone is at a depth of 39 inches.

Permeability of this Asbill soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for firewood production and homesite development.

The production of forage is limited by a dense canopy cover in some areas of the Skyhigh soil and by the susceptibility of the Asbill soil to compaction when moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. In areas where oak trees grow, forage production can be increased by harvesting the trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 40 cords of wood per acre have been measured on the Skyhigh soil. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The main

limitation for seeding is the woody canopy cover on the Skyhigh soil. Among the common understory plants on the Skyhigh soil are soft chess, wild oat, and purple needlegrass. The characteristic plant community on the Asbill soil is wild oat, soft chess, and ripgut brome.

If this unit is used for homesite development, the main limitations are the slow permeability, depth to bedrock, high shrink-swell potential, and low load bearing capacity. The main limitations for septic tank absorption fields are the moderate soil depth and slow permeability, which can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The high shrink-swell potential and low load bearing capacity of the soils in this unit should be considered when designing and constructing foundations, concrete buildings, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soils in this unit are used as a base for roads and streets, they can be mixed with sand and gravel to increase their strength and stability.

The Skyhigh soil is in capability unit IIIe-3 (15), nonirrigated, and the Asbill soil is in capability unit IIIe-5 (15), nonirrigated.

208—Skyhigh-Asbill complex, 15 to 50 percent slopes. This map unit is on hills. The vegetation is mainly annual grasses and oaks with scattered shrubs. Elevation is 1,450 to 2,100 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 50 percent Skyhigh loam and 30 percent Asbill clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Sleeper soils. Also included are small areas of soils that are similar to the Skyhigh soil but are in areas that have a cooler average annual air temperature and soils that have a light-colored surface layer. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Skyhigh soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 2 inches thick. The upper 6 inches of the subsoil is brown clay loam, and the lower 30 inches is brown, yellowish brown, and strong brown clay. Hard, fractured sandstone is at a depth of 38 inches. In some areas the surface layer is clay loam.

Permeability of the Skyhigh soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Asbill soil is moderately deep and well drained. It formed in material weathered from shale or siltstone. Typically, the surface layer is olive gray clay loam 13 inches thick. The underlying material to a depth of 39 inches is olive gray and light olive gray clay. Soft siltstone is at a depth of 39 inches.

Permeability of the Asbill soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It can be used for firewood production.

The production of forage is limited by a dense canopy cover in some areas of the Skyhigh soil and by the susceptibility of the Asbill soil to compaction when moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Where oaks are present, forage production can be increased by managing the harvesting of trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 40 cords of wood per acre have been measured on the Skyhigh soil.

This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The main limitations for seeding are steepness of slope and the woody canopy cover. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. Among the common understory plants on the Skyhigh soil are soft chess, wild oat, and purple needlegrass. The characteristic plant community on the Asbill soil is wild oat, soft chess, and ripgut brome.

This map unit is in capability subclass VIe (15), nonirrigated.

209—Skyhigh-Millsholm loams, 15 to 50 percent slopes. This map unit is on hills. The vegetation is mainly oaks and annual grasses. Elevation is 620 to 2,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Skyhigh loam and 25 percent Millsholm loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit is about 10 percent Bressa soils. Also included are small areas of Asbill, Etsel, Hopland, Maymen, and Sleeper soils; isolated areas of soils that have lower base saturation than do the Skyhill and

Millsholm soils; some areas of stony soils that have 5 to 25 percent of the surface covered with stones and cobbles; small areas of reddish brown soils that are 20 to 40 inches deep and have a loam surface layer and a clay loam or gravelly clay subsoil over sandstone and shale; small areas of Millsholm and Skyhigh soils that have slopes of 50 to 75 percent; soils that are similar to the Millsholm soil but have fine texture or are less than 10 inches deep over bedrock; and soils that are similar to the Skyhigh soil but have a light-colored surface layer. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Skyhigh soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 2 inches thick. The upper 6 inches of the subsoil is brown clay loam, and the lower 30 inches is brown, yellowish brown, and strong brown clay. Hard, fractured sandstone is at a depth of 38 inches.

Permeability of the Skyhigh soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high in the subsoil.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown loam 6 inches thick. The subsoil is light yellowish brown clay loam 10 inches thick. Fractured sandstone is at a depth of 16 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover in some areas and by the restricted available water capacity and shallow depth of the Millsholm soil. Where oaks are present, the amount of forage can be increased by harvesting trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 40 cords of wood per acre have been measured on the Skyhigh soil. The Skyhigh soil responds well to fertilizer, rangeland seeding, and proper grazing use. The main limitations for seeding are steepness of slope and the woody canopy cover in some areas.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect this unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants are soft chess, wild oat, purple needlegrass, and filaree.

If this unit is used for homesite development, the main limitations are steepness of slope, depth to bedrock, and the hazard of erosion on the Millsholm and Skyhigh soils and by slow permeability, low load bearing capacity, and high shrink-swell potential of the Skyhigh soil. Preferred building sites are limited to knolls and the less sloping areas. Extensive cutting and filling generally are required. Deep cuts made during construction can expose bedrock or the clayey subsoil. Cut slopes are susceptible to excessive erosion, and intensive runoff control measures are needed on them. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. Shallow depth to bedrock in the Millsholm soil is a major limitation for septic tank absorption fields. The limitations of moderate depth and slow permeability of the Skyhigh soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The high shrink-swell potential and low load bearing capacity of the Skyhigh soil should be considered when designing and constructing foundations, concrete structures, and roads. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the Skyhigh soil in this unit is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability subclass VIe (15), nonirrigated.

210—Skyhigh-Sleeper-Millsholm association, 8 to 15 percent slopes. This map unit is on hills. The vegetation is mainly oaks and annual grasses. Elevation is 1,250 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 35 percent Skyhigh loam, 30 percent Sleeper loam, and 20 percent Millsholm loam. The Skyhigh and Sleeper soils are on intermediate and lower side slopes. The Millsholm soil is on upper side slopes and hilltops.

Included in this unit are small areas of Asbill and Bressa soils. Also included are small areas of soils on ridgetops that are less than 10 inches deep to bedrock, soils in drainageways that have 20 to 45 percent gravel, and soils that are similar to the Skyhigh soil but have a light-colored surface layer. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Skyhigh soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 2 inches thick. The upper 6 inches of the subsoil is brown clay loam, and the lower 30 inches is brown, yellowish brown, and strong brown clay. Hard, fractured sandstone is at a depth of 38 inches.

Permeability of the Skyhigh soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential is high.

The Sleeper soil is deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface is covered with a mat of oak leaf litter 1 inch thick. The surface layer is brown loam 4 inches thick. The upper 16 inches of the subsoil is pinkish gray loam and clay loam, and the lower 25 inches is pale brown clay. Hard, fractured sandstone is at a depth of 45 inches.

Permeability of the Sleeper soil is slow. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential is high.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown loam 6 inches thick. The subsoil is light yellowish brown clay loam 10 inches thick. Fractured sandstone is at a depth of 16 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for firewood production and homesite development.

The production of forage is limited by a dense canopy cover, particularly on the north-facing slopes, and by the restricted available water capacity and shallow depth of the Millsholm soil. Where oaks are present, forage production can be increased by harvesting trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 40 cords of wood per acre have been measured on the Skyhigh soil. The Skyhigh and Sleeper soils respond well to fertilizer, to rangeland seeding, and to proper grazing use. Among the common understory plants on the Skyhigh and Millsholm soils are soft chess, wild oat, and filaree. The characteristic plant community on the Sleeper soil is soft chess, ripgut brome, and wild oat.

If this unit is used for homesite development, the main limitations are depth to bedrock in the Millsholm and Skyhigh soils and the slow permeability, high shrink-swell potential, and low load bearing capacity of the Skyhigh and Sleeper soils. Shallow depth to bedrock in the Millsholm soil is a major limitation for septic tank absorption fields. The limitations of moderate depth to bedrock in the Skyhigh soil and slow permeability of the Skyhigh and Sleeper soils can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The high shrink-swell potential and low load bearing capacity of the Skyhigh and Sleeper soils should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant moisture content around the foundation area or by backfilling with material that has low shrink-swell potential. If the soils in this unit are used as a base for roads and streets, they can be mixed with sand and gravel to increase their strength and stability.

The Skyhigh and Sleeper soils are in capability subclass IIIe (15), nonirrigated. The Millsholm soil is in capability subclass VIe (15), nonirrigated.

211—Skyhigh-Sleeper-Millsholm association, 15 to 30 percent slopes. This map unit is on hills. The Skyhigh and Sleeper soils are susceptible to slumping and gullying. The vegetation is mainly oaks and annual grasses. Elevation is 1,250 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 40 percent Skyhigh loam, 30 percent Sleeper loam, and 15 percent Millsholm loam. The Skyhigh and Sleeper soils are on intermediate and lower side slopes. The Millsholm soil is on upper side slopes and hilltops.

Included in this unit are small areas of Bressa, Pomo, and Sleeper soils. Also included are small areas of soils on toe slopes that are clayey throughout and have wide cracks at the surface when dry; Millsholm, Skyhigh, and Sleeper soils that have slopes of 30 to 50 percent; soils on hilltops that are similar to the Millsholm soil but are less than 10 inches deep to bedrock; and soils that are similar to the Skyhigh soil but have a light-colored surface layer. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Skyhigh soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 2 inches thick. The upper 6 inches of the subsoil is brown clay loam, and the lower 30 inches is brown, yellowish brown, and strong brown clay. Hard, fractured sandstone is at a depth of 38 inches. In some areas the surface layer is clay loam.

Permeability of the Skyhigh soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high in the subsoil.

The Sleeper soil is deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface is covered with a mat of oak leaf litter 1 inch thick. The surface layer is brown loam 4 inches thick. Below this is brown clay loam 5 inches thick. The subsoil is brown and yellowish brown clay loam 39 inches thick. Hard, fractured sandstone is at a depth of 48 inches. In some areas the surface layer is clay loam.

Permeability of the Sleeper soil is slow. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is pale brown loam 9 inches thick. Below this is pale brown clay loam 6 inches thick. The subsoil is very pale brown clay loam 3 inches thick. Fractured sandstone is at a depth of 18 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover, particularly on the north-facing slopes, and by the restricted available water capacity and shallow depth of the Millsholm soil. Where oaks are present, forage production can be increased by harvesting trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 40 cords of wood per acre have been measured on the Skyhigh soil.

The Skyhigh and Sleeper soils respond well to fertilizer, rangeland seeding, and proper grazing use. Among the common understory plants on the Skyhigh and Millsholm soils are soft chess, wild oat, and filaree. The characteristic plant community on the Sleeper soil is soft chess, ripgut brome, and wild oat.

If this unit is used for homesite development, the main limitations are steepness of slope and the hazard of erosion. Other limitations are depth to bedrock in the Skyhigh and Millsholm soils and slow permeability, high shrink-swell potential, and low load bearing capacity of the Skyhigh and Sleeper soils. Extensive cutting and filling generally are required. Deep cuts made during construction can expose bedrock in the Skyhigh and Millsholm soils or the clayey subsoil in the Skyhigh and Sleeper soils. Roads may fail and landslips may occur following deep soil disturbance resulting from excavation. Cut slopes are susceptible to erosion, and intensive runoff control measures are needed on them. The risk of erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion.

Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. Shallow depth to bedrock in the Millsholm soil is a major limitation for septic tank absorption fields. The limitations of moderate depth of the Skyhigh soil and slow permeability of the Skyhigh and Sleeper soils can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The high shrink-swell potential and low load bearing capacity of the Skyhigh and Sleeper soils should be considered when designing and constructing foundations, concrete structures, and roads. Diverting runoff away from buildings helps to prevent structural damage as a result of shrinking and swelling and to reduce the risk of landslips. If the soils in this unit are used as a base for roads and streets, they can be mixed with sand and gravel to increase their strength and stability.

The Skyhigh and Sleeper soils are in capability subclass IVe (15), nonirrigated. The Millsholm soil is in capability subclass VIe (15), nonirrigated.

212—Skyhigh-Sleeper-Millsholm association, 30 to 50 percent slopes. This map unit is on hills. The Skyhigh and Sleeper soils are susceptible to slumping and gullying. The vegetation is mainly oaks and annual grasses. Elevation is 1,250 to 2,500 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Skyhigh loam, 20 percent Sleeper loam, and 20 percent Millsholm loam. The Skyhigh and Sleeper soils are on intermediate and lower side slopes. The Millsholm soil is on upper side slopes and hilltops.

Included in this unit are small areas of Bressa and Pomo soils. Also included are small areas of soils on toe slopes that are clay loam and clay throughout the profile and have wide cracks at the surface when dry; Skyhigh, Sleeper, and Millsholm soils that have slopes of less than 30 percent; soils that are similar to the Skyhigh soil but have a light-colored surface layer; soils that are similar to the Millsholm soil but are less than 10 inches deep to bedrock and are on hilltops; and soils that are similar to the Sleeper soil but are more than 60 inches deep. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Skyhigh soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 2 inches thick. The upper 6 inches of the subsoil is brown clay loam, and the lower 30 inches is brown, yellowish brown, and strong brown clay. Hard, fractured sandstone is at a

depth of 38 inches. In some areas the surface layer is clay loam.

Permeability of the Skyhigh soil is slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Sleeper soil is deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface is covered with a mat of oak leaf litter 1 inch thick. The surface layer is brown loam 4 inches thick. Below this is brown clay loam 5 inches thick. The subsoil is brown and yellowish brown clay loam 39 inches thick. Hard, fractured sandstone is at a depth of 48 inches. In some areas the surface layer is clay loam.

Permeability of the Sleeper soil is slow. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is pale brown loam 9 inches thick. Below this is pale brown clay loam 6 inches thick. The subsoil is very pale brown clay loam 3 inches thick. Fractured sandstone is at a depth of 18 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for firewood production.

The production of forage is limited by a dense canopy cover, particularly on north-facing slopes, and by the restricted available water capacity and shallow depth of the Millsholm soil. Where oaks are present and slopes are less than 40 percent, forage production can be increased by harvesting trees. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 40 cords of wood per acre have been measured on the Skyhigh soil.

The Skyhigh and Sleeper soils respond well to fertilizer, rangeland seeding, and proper grazing use. The main limitations for seeding are steepness of slope and the woody canopy cover. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. Among the common understory plants on the Skyhigh and Millsholm soils are soft chess, wild oat, and filaree. The characteristic plant community on the Sleeper soil is soft chess, ripgut brome, and wild oat.

This map unit is in capability subclass VIe (15), nonirrigated.

213—Sleeper Variant-Sleeper loams, 5 to 15 percent slopes. This map unit is on hills. These soils are susceptible to slumping. The vegetation is mainly annual grasses and oaks. Elevation is 1,350 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Sleeper Variant loam and 30 percent Sleeper loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. The Sleeper Variant soil is of minor extent in areas of this unit that are in the eastern part of the county.

Included in this unit is about 10 percent Skyhigh soils. Also included are small areas of Millsholm and Still soils, Rock outcrop, and soils that are similar to the Sleeper soil but are 10 to 20 inches deep to bedrock. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Sleeper Variant soil is very deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface layer is light brownish gray loam 12 inches thick. The upper 25 inches of the subsoil is dark grayish brown and olive clay loam, and the lower 19 inches is olive gray clay. Below this to a depth of 75 inches is olive gray clay loam.

Permeability of the Sleeper Variant soil is slow. Available water capacity is 6.0 to 9.5 inches. Rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

The Sleeper soil is deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface is covered with a mat of oak leaf litter 1 inch thick. The surface layer is brown loam 4 inches thick. The upper 16 inches of the subsoil is pinkish gray loam and clay loam, and the lower 25 inches is pale brown clay. Hard, fractured sandstone is at a depth of 45 inches.

Permeability of the Sleeper soil is slow. Available water capacity is 6 to 10 inches. Rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development.

The production of forage is limited by the susceptibility of the soils to compaction when moist and by the presence of a dense canopy cover, particularly in draws and on north-facing slopes. Grazing should be delayed until the soils have drained sufficiently and are firm enough to withstand trampling by livestock. Because of the instability of the soil, trees and brush should be retained on this unit.

This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess, wild oat, and filaree. Where there is a canopy cover of oaks, the common understory plants include soft chess, ripgut brome, and wild oat.

If this unit is used for homesite development, the main limitations are slow permeability, high shrink-swell potential, and low load bearing capacity. If the unit is used for septic tank absorption fields, the limitation of slow permeability can be overcome by increasing the size of the absorption field or by using specially designed sewage disposal systems. The high shrink-swell potential and low load bearing capacity should be considered when designing and constructing foundations, concrete structures, and paved areas. Cutbanks are not stable and are subject to slumping. Diverting runoff away from buildings can help to prevent structural damage as a result of shrinking and swelling. If the soils in this unit are used as a base for roads and streets, they can be mixed with sand and gravel to increase their strength and stability.

This map unit is in capability unit IIIe-3 (15), nonirrigated.

214—Sleeper Variant-Sleeper loams, 15 to 30 percent slopes. This map unit is on hills. These soils are susceptible to slumping. The vegetation is mainly annual grasses and oaks. Elevation is 1,350 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 50 percent Sleeper Variant loam and 35 percent Sleeper loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. The Sleeper Variant soil is of minor extent in areas of this unit that are in the eastern part of the county.

Included in this unit are small areas of Millsholm soils and Rock outcrop and stones. Also included are small areas of soils that are similar to the Sleeper soil but are 10 to 20 inches deep to bedrock. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Sleeper Variant soil is very deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface layer is light brownish gray and grayish brown loam 12 inches thick. The upper 25 inches of the subsoil is dark grayish brown light olive brown and olive clay loam, and the lower 19 inches is olive gray clay. Below this to a depth of 75 inches is olive gray clay loam.

Permeability of the Sleeper Variant soil is slow. Available water capacity is 6.0 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Sleeper soil is deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface is covered with a mat of oak leaf litter 1 inch thick. The surface layer is brown loam 4 inches thick. The upper 16 inches of the subsoil is pinkish gray loam and clay loam, and the lower 25 inches is pale brown clay. Hard, fractured sandstone is at a depth of 45 inches.

Permeability of the Sleeper soil is slow. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development.

The production of forage is limited by the susceptibility of the soils in this unit to compaction when they are moist and by a dense canopy cover, particularly in draws and on north-facing slopes. Grazing should be delayed until the soils have drained sufficiently and are firm enough to withstand trampling by livestock. Because of the instability of the soils, trees and brush should be retained on this unit.

This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess, wild oat, and filaree. Where there is a canopy cover of oaks, the common understory plants include soft chess, ripgut brome, and wild oat.

If this unit is used for homesite development, the main limitations are steepness of slope, the instability of the soil, the hazard of erosion, high shrink-swell potential, low load bearing capacity, and slow permeability. Extensive cutting and filling generally are required. Cut and fill slopes are not stable and are subject to slumping. Roads may fail and landslips may occur on the soils in this unit following deep soil disturbance as a result of excavation. The high shrink-swell potential and low load bearing capacity of the subsoil should be considered when designing and constructing foundations, concrete structures, and paved areas. Diverting runoff away from buildings helps to prevent structural damage as a result of shrinking and swelling and helps to overcome the concerns of soil instability and slumping. If the soils in this unit are used as a base for roads and streets, they can be mixed with sand and gravel to increase their strength and stability. The hazard of sheet and rill erosion is increased if the soil surface is left exposed during site development. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitation of slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system.

This map unit is in capability unit IVe-1 (15), nonirrigated.

215—Sleeper Variant-Sleeper loams, 30 to 50 percent slopes. This map unit is on hills. These soils are susceptible to slumping. The vegetation is mainly annual grasses and oaks. Elevation is 1,350 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 45 percent Sleeper Variant loam and 35 percent Sleeper loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used. The Sleeper Variant soil is of minor extent in areas of this unit that are in the eastern part of the county.

Included in this unit are small areas of Millsholm and Skyhigh soils, Rock outcrop, and stones. Also included are small areas of soils that have slopes of less than 30 percent; soils that are darker colored and have a clay loam over gravelly clay profile that is more than 40 inches deep to weathered basalt or metasedimentary rock; and soils that are similar to the Sleeper soil but are 10 to 20 inches deep to bedrock. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sleeper Variant soil is very deep and well drained. It formed in material weathered from sandstone, shale, or siltstone. Typically, the surface layer is light brownish gray loam 12 inches thick. The upper 25 inches of the subsoil is dark grayish brown and olive clay loam, the next 19 inches is olive gray clay, and the lower part to a depth of 75 inches is olive gray clay loam.

Permeability of the Sleeper Variant soil is slow. Available water capacity is 6.0 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Sleeper soil is deep and well drained. It formed in material weathered from sandstone, siltstone, or shale. Typically, the surface is covered with a mat of leaf litter 1 inch thick. The surface layer is brown loam 4 inches thick. The upper 16 inches of the subsoil is pinkish gray loam and clay loam, and the lower 25 inches is pale brown clay. Hard, fractured sandstone is at a depth of 45 inches.

Permeability of the Sleeper soil is slow. Available water capacity is 6 to 10 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by the susceptibility of the soils in this unit to compaction when moist and by a dense canopy cover of woody plants, particularly in draws and on north-facing slopes. Grazing should be delayed until the soils have drained sufficiently and are firm enough to withstand trampling by livestock. Because of the instability of the soils, trees and brush should be retained on this unit. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The main limitation for seeding is steepness of slope.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce vegetation suitable for grazing. The characteristic plant community on this unit is mainly soft chess, wild oat, and filaree. Where there is a canopy cover of oaks, the common understory plants include soft chess, ripgut brome, and wild oat.

This map unit is in capability subclass VIe (15), nonirrigated.

216—Sobrante-Collayomi-Whispering association, 15 to 30 percent slopes. This map unit is on hills and mountains. The vegetation is mainly annual grasses and oaks on the Sobrante soil and conifers and oaks with an understory of brush on the Collayomi and Whispering soils. Elevation is 1,200 to 3,500 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 140 to 185 days.

This unit is about 40 percent Sobrante loam, 25 percent Collayomi very gravelly loam, and 20 percent Whispering loam. The Sobrante soil is on south- and west-facing slopes. The Collayomi and Whispering soils are on north- and east-facing slopes.

Included in this unit are small areas of Aiken and Hambright soils and Rock outcrop. Also included are small areas of Colloyomi, Sobrante, and Whispering soils that have slopes of 5 to 15 percent or 30 to 50 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, about 10 percent of the surface is covered with stones and boulders 1 to 5 feet in diameter. The surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard, fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Collayomi soil is very deep and well drained. It formed in material weathered from basalt. Typically, about 5 percent of the surface is covered with stones and boulders 2 to 10 feet in diameter. The surface layer

is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam. In some areas the surface layer is cobbly loam or stony loam.

Permeability of the Collayomi soil is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Whispering soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, about 5 percent of the surface is covered with stones and boulders and a mat of pine needles, leaves, and twigs 1 inch thick. The surface layer is brown loam 5 inches thick. The upper 10 inches of the subsoil is reddish yellow gravelly loam, and the lower 11 inches is yellowish red very cobbly clay loam. Hard, fractured basalt is at a depth of 26 inches.

Permeability of the Whispering soil is moderate. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, timber production, wildlife habitat, and watershed.

The production of forage on the Sobrante soil is limited by a dense canopy cover in some areas. The Collayomi and Whispering soils support very sparse stands of plants that are suitable for grazing. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 9 cords of wood per acre have been measured on the Sobrante soil.

The Sobrante soil responds well to fertilizer, rangeland seeding, and proper grazing use. The main limitation for seeding is the dense woody canopy. Livestock grazing should be managed to protect the soil from erosion. Among the common understory plants on the Sobrante soil are soft chess, ripgut brome, and wild oat.

California black oak, ponderosa pine, and Pacific madrone are the main tree species on the Collayomi and Whispering soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 122 on the Collayomi soil and 109 on the Whispering soil. The potential annual production of ponderosa pine on the Collayomi soil is 600 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Whispering soil is 450 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for California black oak and Pacific madrone have not been made.

A concern for the harvesting of timber or firewood is seasonal wetness. Use of wheeled and tracked equipment when the soils are moist produces ruts, compacts the soils, and can damage the roots of trees. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine frequently occurs. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially on south- and southwest-facing slopes.

Among the common forest understory plants are annual grasses, brackenfern, poison-oak, and manzanita.

The Sobrante soil is in capability unit IVe-1 (15), nonirrigated. The Collayomi and Whispering soils are in capability unit IVs-1 (5), nonirrigated.

217—Sobrante-Collayomi-Whispering association, 30 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly annual grasses and oaks on the Sobrante soil and conifers and oaks with an understory of brush on the Whispering and Collayomi soils. Elevation is 1,200 to 3,500 feet. The average annual precipitation is 30 to 50 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 140 to 185 days.

This unit is about 35 percent Sobrante loam, 25 percent Collayomi very gravelly loam, and 15 percent Whispering loam. The Sobrante soil is on south- and west-facing slopes. The Collayomi and Whispering soils are on north- and east-facing slopes.

Included in this unit is about 10 percent Hambright soils. Also included are small areas of Aiken soils, Rock outcrop, and Sobrante soils that have slopes of less than 30 percent. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, about 10 percent of the surface is covered with stones and boulders 1 to 5 feet in diameter. The surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard, fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Collayomi soil is very deep and well drained. It formed in material weathered from basalt. Typically, about 5 percent of the surface is covered with stones and boulders 2 to 10 feet in diameter. The surface layer is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam. In some areas the surface layer is cobbly loam or stony loam.

Permeability of the Collayomi soil is moderate. Available water capacity is 2.5 to 4.5 inches. Effective

rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is moderate.

The Whispering soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, about 5 percent of the surface is covered with stones and boulders. There is a mat of pine needles, leaves, and twigs 1 inch thick on the surface. The surface layer is brown loam 5 inches thick. The upper 10 inches of the subsoil is reddish yellow gravelly loam, and the lower 11 inches is yellowish red very cobbly clay loam. Hard, fractured basalt is at a depth of 26 inches.

Permeability of the Whispering soil is moderate. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, timber production, wildlife habitat, and watershed.

The production of forage on the Sobrante soil is limited by a dense canopy in some areas. The Collayomi and Whispering soils support very sparse stands of forage. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the soil from erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the soil to produce plants suitable for grazing. Among the common understory plants on the Sobrante soil are soft chess, ripgut brome, and wild oat.

California black oak, ponderosa pine, and Pacific madrone are the main tree species on the Collayomi and Whispering soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is estimated to be 122 on the Collayomi soil and 109 on the Whispering soil. The potential annual production of ponderosa pina on the Collayomi soil is 600 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Whispering soil is 450 board feet per acre from a fully stocked stand of trees.

Some concerns for the harvesting of timber or firewood are steepness of slope and the hazard of erosion. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or by cable yarding systems. Rock for construction of roads generally is available on this unit.

Seedling survival is a concern in the production of timber. Proper site preparation on the Collayomi and Whispering soils might make it possible to replace stands of brush and hardwoods with conifers. Reforestation can be accomplished by planting ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine occasionally occurs. Hardwoods can regenerate by sprouting after cutting. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially in areas of the Whispering soil on the south- and southwest-facing slopes.

Among the common forest understory plants are manzanita, poison-oak, brackenfern, and annual and perennial grasses.

The Sobrante soil is in capability subclass VIe (15), nonirrigated, and the Collayomi and Whispering soils are in capability subclass VIe (5), nonirrigated.

218—Sobrante-Guenoc-Hambright complex, 2 to 15 percent slopes. This map unit is on hills. The vegetation is mainly brush, oaks, and annual grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 35 percent Sobrante loam, 30 percent Guenoc clay loam, and 20 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Neice soils and Rock outcrop. The Neice soils are on the steeper slopes. The areas of Rock outcrop occur as escarpments. Also included are small areas of soils that are similar to the Hambright and Sobrante soils but have 10 to 50 percent of the surface covered with stones and boulders or are clay loam and soils on north-facing slopes and in ravines that are similar to the Sobrante soil but have average annual soil temperatures of less than 59 degrees F. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, about 10 percent of the surface is covered with stones and boulders as much as 3 feet in diameter. The surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard, fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

The Guenoc soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown clay loam 3 inches thick. The upper 5 inches of the subsoil is dark red clay, and the lower 20 inches is dark red gravelly clay. Hard, fractured basalt is at a depth of 28 inches. In some areas the surface layer is loam.

Permeability of the Guenoc soil is moderately slow. Available water capacity is 2.0 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is medium, and the hazard of erosion is moderate.

The Hambright soil is shallow and well drained. It formed in material derived from basalt. Typically, the surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Fractured basalt is at a depth of 16 inches.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is medium, and the hazard of erosion is slight.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover in some areas and by the restricted available water capacity and shallow depth of the Hambright soil. Where oaks and brush are present, forage production can be increased by managing the harvesting of trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 9 cords of wood per acre have been measured on the Sobrante and Hambright soils.

The Sobrante and Guenoc soils respond well to fertilizer, rangeland seeding, and proper grazing use. The main limitation for seeding on the Sobrante and Guenoc soils is the woody canopy cover. Seeding generally is not practical on the Hambright soil. Among the common understory plants are soft chess, wild oat, and filaree on the Sobrante and Guenoc soils and soft chess, filaree, manzanita, and chamise on the Hambright soil.

If this unit is used for homesite development, the main limitation is depth to bedrock. Other limitations are the low load bearing capacity and moderately slow permeability of the Guenoc soil. Cuts needed to provide building sites in the steeper areas of this unit can expose bedrock. Shallow depth to bedrock in the Hambright soil is a major limitation for septic tank absorption fields. The limitations of moderate depth to bedrock and moderately slow permeability of the Guenoc soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the limited ability of the Guenoc soil to support a load. If the Guenoc soil is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability subclass VIIs (15), nonirrigated.

219—Sobrante-Guenoc-Hambright complex, 15 to 30 percent slopes. This map unit is on hills. Rock outcroppings and stones 1 to 15 feet in diameter occur randomly throughout the unit. The vegetation is mainly brush, oaks, and annual grasses (fig. 4). Elevation is 800 to 2,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 35 percent Sobrante loam, 25 percent Guenoc clay loam, and 20 percent Hambright very gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Aiken and Collayomi soils and Rock outcrop. The areas of Rock outcrop occur as escarpments. Also included are small areas of soils that are similar to the Hambright soil but are clay loam. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, about 10 percent of the surface is covered with stones and boulders 1 to 5 feet in diameter. The surface layer is reddish brown loam about 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard, fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Guenoc soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown clay loam 3 inches thick. The upper 5 inches of the subsoil is dark red clay, and the lower 20 inches is dark red gravelly clay. Hard, fractured basalt is at a depth of 28 inches. In some areas the surface layer is loam.

Permeability of the Guenoc soil is moderately slow. Available water capacity is 2.0 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Fractured basalt is at a depth of 16 inches. In some areas the surface layer is clay loam.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It is also used for homesite development and firewood production.

The production of forage is limited by a dense canopy cover in some areas and by restricted available water capacity and shallow depth of the Hambright soil. Where

Figure 4.—Typical oak-grassland vegetation in an area of Sobrante-Guenoc-Hambright complex, 15 to 30 percent slopes.

oaks and brush are present, forage production can be increased by managing the harvesting of trees and controlling brush. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 9 cords of wood per acre have been measured on the Sobrante and Hambright soils.

The Sobrante and Guenoc soils respond well to fertilizer, rangeland seeding, and proper grazing use. The main limitation for seeding on the Sobrante and Guenoc soils is the woody canopy cover. Seeding generally is not practical on the Hambright soil. Among the common understory plants are soft chess, wild oat, and filaree on the Sobrante and Guenoc soils and soft chess, filaree, manzanita, and chamise on the Hambright soil.

If this unit is used for homesite development, the main limitations are depth to bedrock, the hazard of erosion, and steepness of slope. Other limitations are the low load bearing capacity and moderately slow permeability of the Guenoc soils. Extensive cutting and filling generally are required. Cut slopes are susceptible to excessive erosion. Intensive runoff control measures are needed. Cuts needed to provide building sites can expose bedrock. The risk of erosion is increased if the soil is left exposed during construction. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour.

Shallow depth of the Hambright soil is a major limitation for septic tank absorption fields. The limitations of moderate depth of the Guenoc and Sobrante soils and moderately slow permeability of the Guenoc soil can be minimized by increasing the size of the septic tank absorptions fields or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the limited ability of the Guenoc soil to support a load. If the Guenoc soil is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability subclass VIIs (15), nonirrigated.

220—Sobrante-Hambright-Guenoc complex, 30 to 50 percent slopes. This map unit is on hills. Rock outcrop and stones 1 to 15 feet in diameter occur randomly throughout the unit. The vegetation is mainly brush, oaks, and annual grasses. Elevation is 800 to 2,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 30 percent Sobrante loam, 25 percent Hambright very gravelly loam, and 20 percent Guenoc clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Collayomi and Konocti Variant soils and Rock outcrop. The areas of Rock outcrop occur as escarpments. Also included are small areas of soils that are similar to the Sobrante soil but are 40 to 70 inches deep. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Sobrante soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown loam 10 inches thick. The upper 11 inches of the subsoil is reddish brown loam, and the lower 17 inches is reddish brown clay loam. Hard, fractured basalt is at a depth of 38 inches.

Permeability of the Sobrante soil is moderate. Available water capacity is 2.5 to 7.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Hambright soil is shallow and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown very gravelly loam 4 inches thick. The subsoil is reddish brown very gravelly loam 12 inches thick. Fractured basalt is at a depth of 16 inches. In some areas the surface layer is clay loam.

Permeability of the Hambright soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Guenoc soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown clay loam 3 inches thick. The upper 5 inches of the subsoil is dark red clay, and the lower 20 inches is dark red gravelly clay. Hard, fractured basalt is at a depth of 28 inches. In some areas the surface layer is loam.

Permeability of the Guenoc soil is moderately slow. Available water capacity is 2.0 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by a dense canopy cover in some areas and by the restricted available water capacity and shallow depth of the Hambright soil. Vegetation in drainageways should be left for erosion control, wildlife habitat, and esthetic purposes. Volumes of 9 cords of wood per acre have been measured on the Sobrante and Hambright soils. Rangeland seeding and fertilizing generally are not practical because of steepness of slope and the woody canopy cover. Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from excessive erosion. Loss of the surface layer results in a severe decrease in productivity and in the potential of the unit to produce plants suitable for grazing. Among the common understory plants are soft chess, wild oat, and filaree on the Sobrante and Guenoc soils and soft chess, filaree, manzanita, and chamise on the Hambright soil.

This map unit is in capability subclass VIIs (15), nonirrigated.

221—Sodabay loam, 5 to 15 percent slopes. This very deep, well drained soil is on hills. It formed in material weathered from dacite, tuff, breccia, or volcanic ash. The vegetation is brush with some oaks and sparse annual grasses. Elevation is 1,350 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is light reddish brown loam 6 inches thick. The upper 46 inches of the subsoil is light reddish brown clay loam, and the lower 11 inches is light reddish brown gravelly clay loam. Weathered pyroclastic tuff is at a depth of 63 inches.

Included in this unit are small areas of Benridge and Konocti soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Sodabay soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for homesite development, orchards, wildlife habitat, and watershed.

If this unit is used for homesite development, the main limitation is the moderately slow permeability. This limitation can be minimized by increasing the size of the absorption field or by installing a specially designed sewage disposal system.

The main crop grown on this unit is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. The main limitations are the hazard of erosion and steepness of slope. Use of a cover crop between rows of trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

Woody shrubs are the most extensive plants in areas of this unit that are not cleared. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

This map unit is in capability unit IIIe-1 (15), nonirrigated.

222—Sodabay loam, 15 to 30 percent slopes. This very deep, well drained soil is on hills. It formed in material weathered from dacite, tuff, breccia, or volcanic ash. The vegetation is mainly brush with some oaks and sparse annual grasses. Elevation is 1,350 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is light reddish brown loam 6 inches thick. The upper 46 inches of the subsoil is light reddish brown clay loam, and the lower 11 inches is light reddish brown gravelly clay loam. Weathered pyroclastic tuff is at a depth of 63 inches.

Included in this unit are small areas of Benridge and Konocti soils. Also included are small areas of Sodabay soils that have slopes of more than 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Sodabay soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for homesite development, wildlife habitat, and watershed.

If this unit is used for homesite development, the main limitations are steepness of slope and moderately slow permeability. Extensive cutting and filling generally are required to provide roadbeds and building sites. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitation of moderately slow permeability can be minimized by increasing the size of the absorption fields or by using a specially designed sewage disposal system.

Woody shrubs are the most extensive plants on this unit. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

This map unit is in capability unit IVe-1 (15), nonirrigated.

223—Sodabay-Konocti association, 5 to 30 percent slopes. This map unit is on hills and mountains. Rock outcroppings and stones 1 to 25 feet in diameter are present, dominantly on the Konocti soil. The vegetation is mainly brush, oaks, and annual grasses. Elevation is 1,350 to 2,000 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 50 percent Sodabay loam, 20 percent Konocti cobbly loam, and 15 percent Konocti stony loam. The Konocti soils are on upper side slopes and ridgetops and in drainageways. The Sodabay soil is on side slopes and toe slopes.

Included in this unit are small areas of Benridge soils. Also included are small areas of Konocti and Sodabay soils that have slopes of more than 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Sodabay soil is very deep and well drained. It formed in material weathered from dacite, tuff, breccia, or volcanic ash. Typically, the surface layer is light reddish brown loam 6 inches thick. The upper 46 inches of the subsoil is light reddish brown clay loam, and the lower 11 inches is light reddish brown gravelly clay loam. Weathered pyroclastic tuff is at a depth of 63 inches.

Permeability of the Sodabay soil is moderately slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is rapid, and the hazard of erosion is severe.

The Konocti cobbly loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown cobbly loam 8 inches thick. The upper 8 inches of the subsoil is brown stony clay loam, and the lower 16 inches is light reddish brown very stony loam. The substratum to a depth of 39 inches is reddish yellow very stony loam. Slightly weathered dacite is at a depth of 39 inches.

Permeability of Konocti cobbly loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Konocti stony loam is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, the surface layer is brown stony loam 4 inches thick. The upper 5 inches of the subsoil is brown stony loam, and the lower 19 inches is light reddish brown very stony clay loam. Slightly weathered dacite is at a depth of 28 inches.

Permeability of the Konocti stony loam is moderately slow. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development and orchards.

Woody shrubs are the most extensive plants on this unit. The characteristic vegetation is mainly California scrub oak, manzanita, and soft chess. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, improve access, and reduce the risk of fire.

If this unit is used for homesite development, the main limitations are steepness of slope, the hazard of erosion, and moderately slow permeability. Other limitations are depth to bedrock in the Konocti soils and large stones in the Konocti stony loam. Extensive cutting and filling generally are required to provide roadbeds and building sites. Cutting can expose bedrock and large stones in the Konocti soils. Cut and fill slopes are susceptible to erosion. The risk of erosion is increased if the soil surface is left exposed during construction. Preserving existing vegetation or revegetating disturbed areas around construction sites helps to control erosion. Slope limits installation of septic tank absorption fields. Absorption lines should be installed on the contour. The limitations of moderately slow permeability of the Sodabay and Konocti soils and moderate depth of the Konocti soils can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Large stones in the Konocti stony loam may interfere with building site preparation.

The main crop grown on this unit is walnuts. Irrigation commonly is not used because an adequate irrigation water supply has not been developed. Walnut orchards are primarily on the Sodabay soil in areas where slopes are 5 to 15 percent. The main limitations are the hazard of erosion and steepness of slope. The Konocti soils are poorly suited to orchards. The main limitations are depth to bedrock, available water capacity, and stones on the surface. Areas of this unit where slopes are 15 to 30 percent are poorly suited to orchards. Use of a cover crop between rows of trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum. Adding organic matter to the soil increases the available water capacity and fertility. Stones on the surface limit the use of most equipment on the Konocti stony loam. Rock deflectors should be used on all mowing equipment.

The Sodabay soil is in capability unit IVe-1 (15), nonirrigated. The Konocti soils are in capability unit IVs-1 (15), nonirrigated.

224—Speaker-Marpa-Sanhedrin gravelly loams, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods. Elevation is 1,800 to 3,800 feet. The average annual precipitation is 40 to 55 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 25 percent Marpa gravelly loam, and 15 percent Sanhedrin gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Etsel, Maymen, and Neuns soils. Also included are small areas of Marpa, Sanhedrin, and Speaker soils that have slopes of more than 50 percent. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Marpa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is light brown gravelly loam 10 inches thick. The upper 5 inches of the subsoil is brown gravelly loam, and the lower 10 inches is strong brown very gravelly clay loam. Sandstone is at a depth of 25 inches.

Permeability of the Marpa soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine and Douglas-fir are the main tree species on the Speaker and Sanhedrin soils. California black oak, interior live oak, and scattered ponderosa pine are the main trees species on the Marpa soil. On the basis of a 100-year site curve, the mean site index is 107 for Douglas-fir and 106 for ponderosa pine on the Speaker soil. On the basis of a 100-year site curve, the mean site index is 103 for Douglas-fir and 105 for ponderosa pine on the Marpa soil. On the basis of a 100-year site curve, the mean site index is 121 for Douglas-fir and 116 for ponderosa pine on the Sanhedrin soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Marpa soil is 415

board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees.

Some concerns for the harvesting of timber are steepness of slope, seasonal soil wetness, and the hazard of erosion. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails on the Speaker and Sanhedrin soils are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on the Speaker and Sanhedrin soils. Revegetation of cut and fill slopes is difficult on the Marpa soil because of the high content of rock fragments and restricted available water capacity.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings on the Marpa soil and on south-facing aspects. Douglas-fir can be planted on the cooler, north-facing aspects and in most areas of the Sanhedrin soil. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir occurs periodically. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings.

Among the common forest understory plants are manzanita, snowberry, rose, and perennial grasses.

This map unit is in capability subclass VIe (5), nonirrigated.

225—Speaker-Maymen-Marpa association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and hardwoods on the Speaker and Marpa soils and brush and hardwoods on the Maymen soil. Elevation is 1,500 to 4,000 feet. The average annual precipitation is about 35 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 25 percent Maymen gravelly loam, and 25 percent Marpa gravelly loam. The Speaker and Marpa soils are on north- and east-facing slopes, and the Maymen soil is on south- and west-facing slopes and on ridges.

Included in this unit are small areas of Bamtush, Etsel, Mayacama, Neuns, and Sanhedrin soils and Rock outcrop. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam about 4 inches thick. The subsoil is light yellowish brown gravelly loam about 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Marpa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is light brown gravelly loam 10 inches thick. The upper 5 inches of the subsoil is brown gravelly loam, and the lower 10 inches is strong brown very gravelly clay loam. Hard, fractured sandstone is at a depth of 25 inches.

Permeability of the Marpa soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for production of timber and firewood.

Douglas-fir, ponderosa pine, and California black oak are the main tree species on the Speaker and Marpa soils. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil and 103 on the Marpa soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil and 105 on the Marpa soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Marpa soil is 415 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are Pacific madrone, sugar pine, and interior live oak. Conifer stands commonly are small and widely scattered, making them generally noncommercial.

Some concerns for the harvesting of timber are the hazard of erosion, seasonal wetness, and steepness of

slope. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment or cable yarding systems. Rock for construction of roads generally is available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion. Revegetation of cut and fill slopes is difficult on the Maymen and Marpa soils because of the restricted available water capacity and high content of rock fragments.

Seedling survival is a concern in the production of timber on this unit. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially in areas of the Marpa soil on south- and southwest-facing slopes. Reforestation of the Speaker and Marpa soils can be accomplished by planting ponderosa pine seedlings. Survival of Douglas-fir seedlings is higher if they are planted on north-facing slopes. If seed trees are present, natural reforestation of cutover areas by conifers occasionally occurs. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations.

Among the common forest understory plants are mountain brome, California fescue, wild pea, and hoary manzanita.

The natural vegetation on the Maymen soil is mainly brush. This soil is used mainly as watershed, wildlife habitat, and recreation areas. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The Speaker and Marpa soils are in capability subclass VIe (5), nonirrigated. The Maymen soil is in capability subclass VIIe (15), nonirrigated.

226—Speaker-Maymen-Marpa association, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and hardwoods on the Speaker and Marpa soils and brush and hardwoods on the Maymen soil. Elevation is 1,500 to 4,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 52 to 56 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 25 percent Maymen gravelly loam, and 20 percent Marpa gravelly loam. The Speaker and Marpa soils are on north- and east-facing slopes, and the Maymen soil is on south- and west-facing slopes and on ridges.

Included in this unit are small areas of Bamtush, Etsel, Mayacama, Neuns, and Sanhedrin soils and Rock outcrop. The areas of Rock outcrop are on ridges or side slopes. Included areas make up about 25 percent of the unit. The percentage varies from one areas to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Marpa soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is light brown gravelly loam 10 inches thick. The upper 5 inches of the subsoil is brown gravelly loam, and the lower 10 inches is strong brown very gravelly clay loam. Hard, fractured sandstone is at a depth of 25 inches.

Permeability of the Marpa soil is moderate. Available water capacity is 1.5 to 4.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for production of timber and firewood.

Ponderosa pine, Douglas-fir, California black oak, and interior live oak are the main tree species on the Speaker and Marpa soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil and 105 on the Marpa soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil and 103 on the Marpa soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Marpa soil is 415 board feet per acre from a fully stocked stand of trees. Estimates of the site index and yield for California black oak and interior live oak have not been made.

The main limitations for the harvesting of timber are steepness of slope and the hazard of erosion. Cable

yarding systems generally should be used on this unit. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads generally is available on this unit. Roads may fail and landslides may occur if deep road cuts are made.

Seedling mortality is a concern in the production of timber. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially on the south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the hotter, south aspects. Natural reforestation of cutover areas by Douglas-fir seldom occurs. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit.

Among the common forest understory plants are mountain brome, California fescue, wild pea, and hoary manzanita.

The natural vegetation on the Maymen soil is mainly brush. This soil is used mainly as watershed, wildlife habitat, and recreation areas. Properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

The Speaker and Marpa soils are in capability subclass VIIe (5), nonirrigated. The Maymen soil is in capability subclass VIIe (15), nonirrigated.

227—Speaker-Maymen-Millsholm association, 30 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly mixed conifers and hardwoods on the Speaker soil, brush on the Maymen soil, and oaks and annual grasses on the Millsholm soil. Elevation is 1,400 to 3,000 feet. The average annual precipitation is 30 to 40 inches. The average annual air temperature of the Maymen and Speaker soils is 53 to 56 degrees F, and the average frost-free period is 155 to 190 days. The average annual air temperature of the Millsholm soil is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

This unit is about 40 percent Speaker loam, 25 percent Maymen gravelly loam, and 15 percent Millsholm loam. The Speaker soil is on east- and north-facing slopes, and the Maymen and Millsholm soils are on west- and south-facing slopes.

Included in this unit are small areas of Bressa, Etsel, Marpa, and Sanhedrin soils. Also included are small areas of Maymen, Millsholm, and Speaker soils that have slopes of less than 30 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is reddish brown loam 9 inches thick. The upper 6 inches of the subsoil is light reddish brown loam, and the lower 24 inches is reddish yellow cobbly clay loam. Soft sandstone is at a depth of 39 inches. In some areas the surface layer is gravelly sandy loam.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam about 4 inches thick. The subsoil is light yellowish brown gravelly loam about 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Millsholm soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is pale brown loam 9 inches thick. The next layer is pale brown clay loam 6 inches thick. The subsoil is very pale brown clay loam 3 inches thick. Fractured sandstone is at a depth of 18 inches.

Permeability of the Millsholm soil is moderate. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for timber production and livestock grazing.

Douglas-fir and ponderosa pine are the main tree species on the Speaker soil. On the basis of a 100-year site curve, the mean site index is 107 for Douglas-fir and 106 for ponderosa pine. The potential annual production of ponderosa pine is 425 board feet per acre from a fully stocked stand of trees. Conifer stands commonly are small and widely scattered, making them generally noncommercial. Among the trees of limited extent are knobcone pine, California black oak, and Pacific madrone.

Some concerns for the harvesting of timber are steepness of slope, seasonal wetness, and the hazard of erosion. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of wheeled and tracked equipment or cable yarding systems. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails are slippery when wet. They may be

impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Seedling mortality is a concern in the production of timber. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially on the south- and southwest-facing slopes. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the hotter, south aspects. If seed trees are present, natural reforestation of cutover areas by Douglas-fir seldom occurs. Proper site preparation is necessary to replace stands of brush and hardwoods with conifers on the Speaker soil. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations on this unit.

The production of forage is limited by a dense canopy cover in some areas and by the restricted available water capacity and shallow depth of the Millsholm soil. The Speaker and Maymen soils support very sparse stands of vegetation suitable for grazing. Where oaks are present on the Millsholm soil, forage production can be increased by managing the harvesting of trees. Because of the instability of the Millsholm soil, trees should be retained. In areas dominated by brush, properly planned and applied prescribed burning or chemical or mechanical treatment can be used in small areas to improve habitat for wildlife, increase access, and reduce the risk of fire.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Livestock grazing should be managed to protect the unit from erosion.

Among the common forest understory plants on the Speaker soil are mountain brome, California fescue, wild pea, and hoary manzanita. The characteristic plant community on the Maymen soil is mainly chamise and ceanothus. Among the common understory plants on the Millsholm soil are soft chess, filaree, and manzanita.

The Speaker soil is in capability subclass VIe (5), nonirrigated; the Maymen soil is capability subclass VIIe (15), nonirrigated, and the Millsholm soil is in capability subclass VIe (15), nonirrigated.

228—Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods with some shrubs. Elevation is 1,600 to 3,500 feet. The average annual precipitation is 40 to 50 inches, the average annual air temperature is 50 to 56 degrees F, and the average frost-free period is 130 to 190 days.

This unit is about 35 percent Speaker gravelly loam and 30 percent Sanhedrin gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bamtush, Etsel, Marpa, and Maymen soils. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat partially decomposed needles, leaves, and twigs 1 inch thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly clay loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used as wildlife habitat and watershed. It is also used for timber production.

Douglas-fir, ponderosa pine, and California black oak are the main tree species in some areas of this unit. In many areas knobcone pine, California black oak, California-laurel, and Pacific madrone are dominant because of past fires. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil and 121 on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil and 116 on the Sanhedrin soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees.

The main limitations for the harvesting of timber are steepness of slope and the hazard of erosion. Cable yarding systems are suited to this unit. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Harvesting systems that lift logs entirely off the ground reduce the disturbance of the protective layer of duff. A concern for the harvesting of timber is seasonal

wetness. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Roads may fail and landslides may occur if deep road cuts are made.

Plant competition is a concern in the reforestation and production of timber. Proper site preparation on this unit is necessary to replace stands of brush, knobcone pine, and hardwoods with commercial conifers. Reforestation can be accomplished by planting Douglas-fir and ponderosa pine seedlings. Because of the high risk of fire on the surrounding brush-covered soils, firebreaks are needed to protect plantations and other improvements on this unit.

Among the common forest understory plants are bedstraw, wild pea, annual grasses, and forbs.

This map unit is in capability subclass VIIe (5), nonirrigated.

229—Speaker-Sanhedrin-Maymen association, 30 to 50 percent slopes. This map unit is on mountains. The vegetation is mainly mixed conifers and hardwoods and some brush on the Speaker and Sanhedrin soils and brush with some annual grasses on the Maymen soil. Elevation is 2,100 to 4,000 feet. The average annual precipitation is 40 to 60 inches. The average annual air temperature in areas of the Speaker and Sanhedrin soils is 50 to 55 degrees F, and the average frost-free period is 120 to 180 days. The average annual air temperature in areas of the Maymen soil is 52 to 56 degrees, and the average frost-free period is 130 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 30 percent Sanhedrin gravelly loam, and 20 percent Maymen gravelly loam. The Maymen soil is on west- and south-facing, brush-covered side slopes and ridgetops, and the Speaker and Sanhedrin soils are on east- and north-facing slopes.

Included in this unit are small areas of Bamtush, Etsel, and Neuns soils. Also included are small areas of soils that are at an elevation of more than 4,000 feet. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone and shale. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone or shale. Typically, the upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Maymen soil is shallow and somewhat excessively drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown gravelly loam 4 inches thick. The subsoil is light yellowish brown gravelly loam 8 inches thick. Hard, fractured sandstone is at a depth of 12 inches.

Permeability of the Maymen soil is moderate. Available water capacity is 1 to 3 inches. Effective rooting depth is 12 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Ponderosa pine and Douglas-fir are the main tree species on the Speaker and Sanhedrin soils. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil and 116 on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil and 121 on the Sanhedrin soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are California black oak, Pacific madrone, and sugar pine.

Some concerns for the harvesting of timber are steepness of slope, the hazard of erosion, and seasonal wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unless adequate plant cover or water bars are provided, steep yarding paths, skid trails, and firebreaks are subject to rilling and gullying. Disturbance of the protective layer of duff can be reduced by the careful use of either wheeled and tracked equipment or cable harvesting systems. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion on these soils.

Plant competition is a concern in the production of timber. When openings are made in the canopy, invading brushy plants that are not controlled can delay the establishment of seedlings. Reforestation can be accomplished by planting ponderosa pine seedlings on

the hotter aspects and Douglas-fir on the cooler, north aspects. If seed trees are present, natural reforestation of cutover areas by ponderosa pine and Douglas-fir occurs periodically.

Among the common forest understory plants are wild pea, bedstraw, snowberry, rose, and annual forbs.

The natural vegetation on Maymen soil is mainly brush. The species in most areas are mainly chamise, manzanita, and buckbrush.

The Speaker and Sanhedrin soils are in capability subclass VIe (5), nonirrigated. The Maymen soil is in capability subclass VIIe (15), nonirrigated.

230—Speaker-Speaker Variant-Sanhedrin association, 5 to 30 percent slopes. This map unit is on broad ridgetops on mountains. The vegetation is mainly mixed conifers and hardwoods and some brush. Elevation is 2,200 to 4,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 120 to 180 days.

This unit is about 30 percent Speaker gravelly loam, 25 percent Speaker Variant loam, and 20 percent Sanhedrin gravelly loam. The Speaker Variant soil is on broad ridgetops, and the Speaker and Sanhedrin soils are on shoulder slopes and side slopes.

Included in this unit are small areas of Marpa and Maymen soils. Also included are small areas of soils that are similar to the Speaker soil but have a loam subsoil. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Speaker soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, and twigs 1 inch thick. The surface layer is brown gravelly loam 2 inches thick. The upper 6 inches of the subsoil is reddish yellow gravelly loam, and the lower 19 inches is reddish yellow clay loam. Soft sandstone is at a depth of 27 inches.

Permeability of the Speaker soil is moderately slow. Available water capacity is 2 to 6 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Speaker Variant soil is shallow and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is light yellowish brown loam 4 inches thick. The upper 6 inches of the subsoil is light yellowish brown clay loam, and the lower 7 inches is reddish yellow gravelly clay loam. Soft sandstone is at a depth of 17 inches.

Permeability of the Speaker Variant soil is moderately slow. Available water capacity is 1.5 to 3.5 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Sanhedrin soil is deep and well drained. It formed in material weathered from sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 2 inches thick. The upper part of the surface layer is brown gravelly loam 4 inches thick, and the lower part is pale brown gravelly loam 4 inches thick. The upper 33 inches of the subsoil is light yellowish brown and reddish yellow gravelly loam, and the lower 16 inches is reddish yellow gravelly clay loam. Weathered sandstone is at a depth of 57 inches.

Permeability of the Sanhedrin soil is moderately slow. Available water capacity is 4 to 8 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for timber production, wildlife habitat, and watershed.

Douglas-fir and ponderosa pine are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for Douglas-fir is 107 on the Speaker soil, 80 on the Speaker Variant soil, and 121 on the Sanhedrin soil. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 106 on the Speaker soil, 80 on the Speaker Variant soil, and 116 on the Sanhedrin soil. The potential annual production of ponderosa pine on the Speaker soil is 425 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Speaker Variant soil is 225 board feet per acre from a fully stocked stand of trees. The potential annual production of ponderosa pine on the Sanhedrin soil is 530 board feet per acre from a fully stocked stand of trees. Among the trees of limited extent are California black oak, Pacific madrone, and sugar pine.

A concern for the harvesting of timber is seasonal soil wetness. Use of wheeled and tracked equipment when the soil is moist produces ruts, compacts the soil, and can damage the roots of trees. Unsurfaced roads and skid trails are slippery when wet. They may be impassable during rainy periods. Rock for construction of roads is not readily available on this unit. Establishing plant cover on steep cut and fill slopes reduces erosion.

Seedling survival is a concern in the production of timber. Reforestation can be accomplished by planting Douglas-fir seedlings on the cooler aspects and ponderosa pine on the hotter, south aspects. If seed trees are present, natural reforestation of cutover areas by Douglas-fir and ponderosa pine occurs periodically. The high soil temperature and low content of soil moisture during the growing season cause mortality of seedlings, especially in areas of the Speaker and Speaker Variant soils on south- and southwest-facing slopes.

Among the common forest understory plants are wild pea, mountain brome, California fescue, and manzanita.

The Speaker and Sanhedrin soils are in capability unit IVe-1 (5), nonirrigated, and the Speaker Variant soil is in capability subclass VIe (5), nonirrigated.

231—Squawrock-Shortyork Variant gravelly loams, 15 to 30 percent slopes. This map unit is on mountains. The Shortyork soil is susceptible to slumping. The vegetation is mainly annual grasses and forbs with a few scattered oaks and conifers. Elevation is 2,000 to 4,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 54 to 58 degrees F, and the average frost-free period is 130 to 180 days.

This unit is about 40 percent Squawrock gravelly loam and 35 percent Shortyork Variant gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Neuns, Speaker, and Yorkville soils. Also included are small areas of Shortyork and Squawrock soils that have slopes of less than 15 percent or more than 30 percent and soils that are similar to the Squawrock soil but are less than 20 inches deep to bedrock. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Squawrock soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown gravelly loam 8 inches thick. The subsoil is light brownish gray very gravelly clay loam 29 inches thick. Hard, fractured sandstone is at a depth of 37 inches.

Permeability of the Squawrock soil is moderate. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Shortyork Variant soil is moderately deep and well drained. It formed in material weathered from metamorphased sandstone and greenstone. Typically, the surface layer is dark grayish brown gravelly loam 9 inches thick. The upper 3 inches of the subsoil is grayish brown very gravelly clay loam, and the lower 20 inches is variegated brown and light olive brown very gravelly clay. Hard, fractured greenstone and metamorphosed sandstone are at a depth of 32 inches.

Permeability of the Shortyork Variant soil is very slow. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by the restricted available water capacity of the Squawrock soil and by the susceptibility of the Shortyork Variant soil to compaction when wet. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess and wild oat.

This map unit is in capability subclass VIe (15), nonirrigated.

232—Still loam. This very deep, well drained soil is on alluvial plains. It formed in alluvium derived from mixed rock sources, dominantly sandstone and shale. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses, forbs, and scattered oaks. Elevation is 1,000 to 2,000 feet. The average annual precipitation is 25 to 34 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is brown loam 7 inches thick. The next layer is brown clay loam 25 inches thick. The underlying material to a depth of 70 inches is brown clay loam.

Included in this unit are small areas of Kelsey and Talmage soils. Also included are small areas of clayey soils in depressional areas, soils that are similar to this Still soil but have a seasonal high water table at a depth of 4 to 6 feet, soils that are similar to this Still soil but have a surface layer that has been compacted by livestock or are at an elevation of as much as 2,400 feet, and soils that are similar to this Still soil but are in narrow valleys adjacent to hills and mountains and have a shorter frost-free period because of cold air drainage. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Still soil is moderately slow. Available water capacity is 8.5 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. Some areas adjacent to stream channels are subject to rare periods of flooding. Many areas of this soil are protected by dikes and levees.

This unit is used mainly for orchards, vineyards, and hay and pasture. It is also used for homesite development.

The main crops grown on this unit are wine grapes, walnuts, and pears. Irrigation commonly is used for maximum production of these crops. The main limitation is the hazard of flooding. In areas with a flooding hazard, capital improvements should be designed to withstand flooding.

This unit is well suited to hay and pasture.

If this unit is used for homesite development, the main limitations are moderately slow permeability and the hazard of flooding. Increasing the size of the septic tank absorption fields or using a specially designed disposal system can help to compensate for the moderately slow permeability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability class I (14), irrigated, and capability unit IIIc-1 (14), nonirrigated.

233—Still loam, stratified substratum. This very deep, well drained soil is on alluvial plains. It formed in alluvium derived from mixed rock sources, dominantly sandstone and shale. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs with scattered oaks. Elevation is 1,000 to 2,000 feet. The average annual precipitation is 25 to 34 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the upper part of the surface layer is brown loam 6 inches thick and the lower part is brown clay loam 30 inches thick. The upper 16 inches of the underlying material is stratified, brown clay loam and loam, and the lower part to a depth of 70 inches is extremely gravelly loamy coarse sand. In some areas the surface layer is gravelly loam.

Included in this unit are small areas of Cole, Cole Variant, Kelsey, Lupoyoma, and Talmage soils and Xerofluvents. Also included are small areas of soils that are similar to this Still soil but have a seasonal high water table at a depth of 2 to 4 feet, soils that have a surface layer that has been compacted by livestock, soils that do not have a gravelly substratum, and soils that are similar to this Still soil but are at elevations of as much as 2,300 feet. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Still soil is moderately slow. Available water capacity is 7.5 to 10.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. Some areas adjacent to stream channels are subject to rare periods of flooding. Many areas of this soil are protected from flooding by dikes and levees.

This unit is used mainly for orchards, vineyards, and hay and pasture. It is also used for homesite development.

The main crops grown on this unit are walnuts, pears, and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitation is the hazard of flooding in some areas. In areas that are subject to flooding, capital improvements should be designed to withstand flooding.

This unit is well suited to hay and pasture.

If this unit is used for homesite development, the main limitations are the moderately slow permeability, the rapidly permeable underlying material, and the hazard of flooding. Increasing the size of the septic tank absorption fields or using a specially designed sewage disposal system can help to compensate for the moderately slow permeability. The disposal system should be designed so that effluent does not reach the rapidly permeable underlying material. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability class I (14), irrigated, and capability unit IIIc-3 (14), nonirrigated.

234—Still gravelly loam. This very deep, well drained soil is on alluvial plains. It formed in alluvium derived from mixed rock sources, dominantly sandstone or shale. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses, forbs, and a few scattered oaks. Elevation is 1,300 to 2,000 feet. The average annual precipitation is 25 to 34 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the upper part of the surface layer is brown gravelly loam 3 inches thick and the lower part to a depth of 36 inches brown gravelly clay loam. The underlying material to a depth of 70 inches is brown clay loam. In some areas the surface layer is very gravelly loam.

Included in this unit are small areas of Cole Variant, Kelsey, Lupoyoma, and Talmage soils and Xerofluvents. Also included are small areas of Still soils, mainly in Scotts Valley, that have slopes of 2 to 5 percent, soils at elevations of as much as 2,400 feet, soils that are similar to this Still soil but are in narrow valleys adjacent to hills and mountains and have a shorter frost-free period because of cold air drainage, and soils that are lighter colored throughout the profile. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Still soil is moderately slow. Available water capacity is 7.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. Some areas adjacent to stream channels are subject to rare periods of flooding. Some areas are protected from flooding by dikes and levees.

This unit is used mainly for orchards, vineyards, and hay and pasture. It is also used for homesite development.

This unit is well suited to hay and pasture.

This unit is well suited to orchards and vineyards. The main crops grown on this unit are walnuts, pears, and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitation is the hazard of flooding. In areas that are subject to flooding, capital improvements should be designed to withstand flooding.

If this unit is used for homesite development, the main limitations are the moderately slow permeability and the hazard of flooding. Increasing the size of the septic tank absorption fields or using a specially designed sewage disposal system can help to compensate for the moderately slow permeability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from

flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability units IIs-4 (14), irrigated, and IIIs-4 (14), nonirrigated.

235—Still-Talmage complex, 2 to 8 percent slopes. This map unit is on alluvial fans and flood plains. The vegetation is mainly annual grasses and forbs with scattered oaks. Elevation is 1,300 to 1,800 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

This unit is about 55 percent Still gravelly loam and 30 percent Talmage very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Cole Variant and Kelsey soils and Xerofluvents. Also included are small areas of soils that are similar to the Still and Talmage soils but are at elevations of as much as 2,900 feet. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Still soil is very deep and well drained. It formed in alluvium derived from mixed rock sources, dominantly sandstone or shale. Typically, the upper part of the surface layer is brown gravelly loam 3 inches thick and the lower part is brown gravelly clay loam 33 inches thick. The underlying material to a depth of 70 inches is brown clay loam. In some areas the surface layer is very gravelly loam.

Permeability of the Still soil is moderately slow. Available water capacity is 7.5 to 9.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is moderate. Areas of this soil near stream channels are subject to rare periods of flooding during prolonged, high-intensity storms.

The Talmage soil is very deep and somewhat excessively drained. It formed in alluvium derived from mixed sources. Typically, the surface layer is grayish brown very gravelly sandy loam 33 inches thick. The underlying material to a depth of 70 inches is stratified, light yellowish brown and grayish brown gravelly sandy loam, very gravelly loam, and gravelly loam. In some areas the surface layer is gravelly sandy loam.

Permeability of the Talmage soil is moderately rapid. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is medium, and the hazard of erosion is slight. Areas of this soil near stream channels are subject to rare periods of flooding during prolonged, high-intensity storms.

This unit is used mainly for livestock grazing and hay and pasture. It is also used for orchards and vineyards.

The production of forage on the Talmage soil is limited by the restricted available water capacity. The Still soil has few limitations and responds well to rangeland seeding and fertilization. Rangeland seeding on the Talmage soil generally is not practical because of the restricted available water capacity and high content of gravel. Livestock should be fenced out of gullies and off streambanks to help control erosion. The characteristic plant community on this unit is mainly soft chess, filaree, and wild oat.

If this unit is used for hay and pasture, the main limitations are the restricted available water capacity and the very gravelly surface layer of the Talmage soil. Frequent irrigations may be needed because of the restricted available water capacity of the Talmage soil. Rock fragments in the surface layer of the Talmage soil cause the rapid wear of tillage equipment.

The main crops grown on this unit are walnuts, pears, and wine grapes. Irrigation commonly is used for maximum production of these crops. The main limitations of this unit are the hazard of flooding in areas adjacent to streams and the restricted available water capacity and the very gravelly surface layer of the Talmage soil. Capital improvements on this unit should be built to withstand flooding. To avoid overirrigating and leaching of plant nutrients, application of irrigation water should be adjusted to the restricted available water capacity of the Talmage soil, the water intake rate, and the crop needs. Rock fragments in the surface layer cause the rapid wear of tillage equipment.

This map unit is in capability unit IVs-4 (14), irrigated and nonirrigated.

236—Stonyford-Guenoc complex, 30 to 50 percent slopes. This map unit is on hills. The vegetation is mainly brush and sparse annual grasses. Elevation is 1,400 to 2,500 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 57 to 60 degrees F, and the average frost-free period is 160 to 205 days.

This unit is about 40 percent Stonyford gravelly loam and 35 percent Guenoc clay loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Guenoc and Stonyford soils that are on flat, rounded knolls and have slopes of 5 to 30 percent. Also included are small areas of soils that are similar to the Guenoc soil but are more than 40 inches deep and soils that are similar to the Stonyford and Guenoc soils but have more than 35 percent rock fragments. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Stonyford soil is shallow and somewhat excessively drained. It formed in material weathered from basalt. Typically, the surface layer is dark reddish brown gravelly loam 2 inches thick. The upper 3 inches of the subsoil is yellowish red gravelly loam, and the lower 5 inches is yellowish red gravelly clay loam. Hard,

fractured, metamorphased basalt is at a depth of 10 inches.

Permeability of the Stonyford soil is moderately slow. Available water capacity is 1 inch to 3 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Guenoc soil is moderately deep and well drained. It formed in material weathered from basalt. Typically, the surface layer is reddish brown clay loam 3 inches thick. The upper 5 inches of the subsoil is dark red clay, and the lower 20 inches is dark red gravelly clay. Hard, fractured basalt is at a depth of 28 inches.

Permeability of the Guenoc soil is moderately slow. Available water capacity is 2.0 to 6.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for homesite development. Areas that are cleared can also be used for livestock grazing.

If this unit is used for homesite development, the main limitations are steepness of slope, depth to bedrock, and the hazard of erosion. Other limitations are the moderately slow permeability and low load bearing capacity of the Guenoc soil. Preferred building sites are limited to knolls and the less sloping areas. Steepness of slope presents many problems when the unit is used for homesite development. Extensive cutting and filling generally are required. Cuts needed to provide building sites can expose bedrock. Cut slopes are susceptible to erosion. Intensive runoff control measures are needed. The risk of erosion is increased if the soil is left exposed during construction. Preserving existing vegetation and revegetating disturbed areas around construction sites help to control erosion. Slope and shallow depth to bedrock in the Stonyford soil are major limitations for septic tank absorption fields. Absorption lines should be installed on the contour. The limitations of moderate depth and slow permeability of the Guenoc soil can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. Buildings and roads should be designed to offset the limited ability of the Guenoc soil to bear a load. If this soil is used as a base for roads and streets, it can be mixed with sand and gravel to increase its strength and stability.

The production of forage is limited by a tendency of this unit to produce woody species and by the restricted available water capacity and shallow depth of the Stonyford soil. If the shrubs are managed to create open areas, this unit can produce a good stand of desirable grasses and forbs. Leaving woody plants in the drainageways and in areas where slopes are more than 40 percent reduces erosion and provides habitat for wildlife. The characteristic plant community is mainly chamise, manzanita, and ceanothus.

This map unit is in capability subclass VIe (15), nonirrigated.

237—Talmage very gravelly sandy loam. This very deep, somewhat excessively drained soil is on alluvial fans and flood plains and in areas adjacent to drainageways. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation is mainly annual grasses and forbs with scattered oaks. Elevation is 1,300 to 1,800 feet. The average annual precipitation is 25 to 50 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is grayish brown very gravelly sandy loam 33 inches thick. The underlying material to a depth of 70 inches is stratified, light yellowish brown and grayish brown gravelly sandy loam, very gravelly loam, and gravelly loam. In some areas the surface layer is gravelly sandy loam.

Included in this unit are small areas of Kelsey soils, Xerofluvents, and soils that are similar to this Talmage soil but are at elevations of more than 1,800 feet in Gravelly Valley, near Lake Pillsbury, and in Johnson's Glade, south of Pine Mountain. Also included are small areas of soils that are similar to this Talmage soil but have less than 35 percent gravel throughout the profile, have a lighter colored surface layer, or have a subsoil of sandy clay loam or clay loam. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Talmage soil is moderately rapid. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. Areas of this soil near stream channels are subject to rare periods of flooding during prolonged, high-intensity storms.

This unit is used mainly for livestock grazing and for hay and pasture. It is also used for orchards and vineyards.

The production of forage is limited by the high content of gravel in the soil and the restricted available water capacity. Seeding on this unit generally is not practical. This unit is limited for livestock watering ponds and other water impoundments because of the seepage potential. The characteristic plant community on this unit is mainly soft chess and filaree.

This unit is poorly suited to hay and pasture. The main limitations are the restricted available water capacity and the very gravelly surface layer. Frequent irrigations may be needed because of the restricted available water capacity. Water should be applied in amounts sufficient to wet the root zone but in amounts small enough to minimize the leaching of plant nutrients. Rock fragments in the surface layer cause the rapid wear of tillage equipment.

This unit is poorly suited to irrigated crops. The main crops grown are walnuts and wine grapes. Irrigation

commonly is used for maximum production of these crops. The restricted available water capacity, the very gravelly surface layer, and the rare periods of flooding are the main limitations. To avoid overirrigating and leaching of plant nutrients, application of irrigation water should be adjusted to the restricted available water capacity, the water intake rate, and the crop needs. Rock fragments in the surface layer cause the rapid wear of tillage equipment. Capital improvements on this unit should be designed to withstand flooding.

This map unit is in capability unit IVs-4 (14), irrigated and nonirrigated.

238—Tulelake silty clay loam, flooded. This very deep, poorly drained soil is in intermittent lake basins. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs and water tolerant plants. Elevation is 1,300 to 1,400 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 170 to 210 days.

Typically, the surface layer is grayish brown silty clay loam 10 inches thick. The underlying material to a depth of 77 inches is stratified, gray and light brownish gray silty clay loam and silty clay.

Included in this unit are small areas of Landlow Variant, Maywood Variant, and Still soils. Also included are small areas of soils that are similar to this Tulelake soil but are loam, silt loam, sandy loam, or silty clay loam and have a thick, dark-colored surface layer that is high in content of organic matter; these soils are mainly at the eastern end of Tule Lake and in Scotts Valley. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Tulelake soil is slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is limited by the presence of a seasonal high water table. This soil is subject to frequent, long to very long periods of flooding during winter and spring. The part of this unit that is in Tule Lake is artificially drained in spring and summer by pumping into Scotts Creek. The water table drops to between 3 and 6 feet by late in summer and fall. Surface runoff is ponded, and the hazard of erosion is slight.

This unit is used for hay and pasture and field crops.

If this unit is used for hay and pasture, the main limitations are the hazard of flooding, the seasonal high water table, and poor drainage. The risk of flooding can be reduced by the use of dikes and levees. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill. Irrigation commonly is not needed in areas where the water table remains at a shallow depth during most of the growing season.

The main crops grown on this unit are safflower, sunflower, and milo. Some wild rice is also grown. These crops commonly do not need irrigation because of the shallow depth to the seasonal high water table in the early part of the growing season. The main limitations are the hazard of flooding, the seasonal high water table, and poor drainage. Capital improvements should be designed to withstand flooding. Excess water can be removed by installing subsurface drains or drainage ditches, or both.

This map unit is in capability unit IVw-2 (14), irrigated and nonirrigated.

239—Tulelake silty clay loam, protected. This very deep, poorly drained soil is in reclaimed lake basins. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation in areas not cultivated is mainly annual grasses and forbs and water tolerant species. Elevation is 1,300 to 1,400 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is grayish brown silty clay loam 10 inches thick. The underlying material to a depth of 77 inches is stratified, gray and light brownish gray silty clay loam and silty clay.

Included in this unit are small areas of Cole and Landlow Variant soils. Also included are small areas of soils that are similar to this Tulelake soil but are calcareous and have less clay. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

Permeability of Tulelake soil is slow. Available water capacity is 9.0 to 10.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is slow, and the hazard of water erosion is slight. This soil is within the Westlake Reclamation District. A dam at the lower end of Tule Lake and dikes and levees protect the soil from flooding. Flooding may occur, however, during abnormally wet years. In winter and early in spring, this soil has a water table that fluctuates between depths of 18 and 36 inches. The water table drops to below a depth of 60 inches during the growing season. The shrink-swell potential is high in the subsoil.

This unit is used mainly for hay and pasture.

If this unit is used for hay and pasture, the main limitations are poor drainage and slow permeability. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Because of the slow permeability, the application of irrigation water should be regulated so that water does not stand on the surface for long periods of time. Wetness limits the choice of plants and the period of cutting or grazing and increases the risk of winterkill.

This map unit is in capability unit IIIw-2 (14), irrigated and nonirrigated.

240—Tyson-Neuns gravelly loams, 30 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly hardwoods, shrubs, and some conifers. Elevation is 3,300 to 5,000 feet. The average annual precipitation is 40 to 60 inches, the average annual air temperature is 48 to 54 degrees F, and the average frost-free period is 110 to 170 days.

This unit is about 40 percent Tyson gravelly loam and 35 percent Neuns gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Sheetiron, and Speaker soils. Also included are small areas of soils that are similar to the Tyson soil but have more clay in the subsoil or have less than 35 percent rock fragments, soils that are similar to the Neuns soil but have more clay in the subsoil, and soils that are at elevations of more than 5,000 feet. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Tyson soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone. Typically, the surface is covered with a mat of decomposed and partially decomposed leaves, twigs, and bark 1.5 inches thick. The upper part of the surface layer is dark grayish brown gravelly loam 9 inches thick, and the lower part is brown very gravelly loam 6 inches thick. The subsoil is light yellowish brown very cobbly clay loam 12 inches thick. Hard, fractured, metamorphosed sandstone is at a depth of 27 inches.

Permeability of the Tyson soil is moderate. Available water capacity is 1.5 to 5.0 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Neuns soil is moderately deep and well drained. It formed in material weathered from sandstone and metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed needles, leaves, twigs, and bark 1.5 inches thick. The surface layer is light yellowish brown gravelly loam 4 inches thick. The upper 10 inches of the subsoil is pale brown very gravelly loam, and the lower 17 inches is reddish yellow very gravelly loam. Hard, fractured sandstone is at a depth of 31 inches.

Permeability of the Neuns soil is moderate. Available water capacity is 1.0 inch to 3.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as watershed and wildlife habitat. It is also used for firewood production.

Brewer oak and Oregon white oak are the main tree species on this unit. Volumes of 10 to 20 cords of wood per acre have been measured on the Tyson soil. Among the trees of limited extent are Douglas-fir and California black oak. Conifer stands commonly are small and widely scattered, making them generally noncommercial.

Among the common forest understory plants are blue wildrye, bedstraw, brodiaea, lupine, and annual grasses.

This map unit is in capability subclass VIIs (5), nonirrigated.

241—Vitrandepts-Cinder land complex, 15 to 75 percent slopes. This map unit is on volcanic cinder cones. The native vegetation is mainly brush and scattered oaks and conifers. Elevation is 1,500 to 2,200 feet. The average annual precipitation is 24 to 32 inches, the average annual air temperature is 56 to 60 degrees F, and the average frost-free period is 160 to 210 days.

This unit is 45 percent Vitrandepts and 45 percent Cinderland. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Konocti, Konocti Variant, and Sodabay soils. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

No single profile of Vitrandepts is typical, but one commonly observed in the survey area has a dark brown cindery sandy loam surface layer 7 inches thick. The upper 30 inches of the subsoil is brown and yellowish red very cindery sandy loam, and the lower 16 inches is yellowish red extremely cindery sandy loam. Scoriaceous basalt and scoria are at a depth of 53 inches. Depth to cindery bedrock ranges from 20 inches to more than 60 inches.

Permeability of Vitrandepts is rapid. Available water capacity is very low or low.

Cinderland is composed of loose cinders and other scoriaceous magmatic ejecta. Available water capacity is 1.5 to 2.5 inches.

This unit is used mainly as wildlife habitat and watershed. It is also used as cinder quarries.

In areas where this unit is used as cinder quarries, the topsoil should be stockpiled for use during land reclamation after mining is complete.

This map unit is in capability class VIII (15), nonirrigated.

242—Wappo loam, 2 to 8 percent slopes. This very deep, moderately well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is mainly annual grasses and forbs with scattered oaks. Elevation is 1,400 to 1,600 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 57 to 59 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is brown loam 10 inches thick. The upper 24 inches of the subsoil is strong brown clay, and the lower 17 inches is reddish yellow clay loam and sandy clay loam. The substratum to a depth of 63 inches is light yellowish brown clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Forbesville and Manzanita soils. Also included are small areas of soils, on convex ridges and side slopes, that are similar to the Wappo soil but are 20 to 40 inches deep over sedimentary rock and small areas of soils that have 15 to 35 percent gravel in the substratum. This unit is dissected by numerous drainageways 1 foot to 10 feet deep. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wappo soil is very slow. Available water capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. The clay layer in the subsoil may restrict root penetration. Surface runoff is medium, and the hazard of erosion is moderate. The shrink-swell potential in the subsoil is high.

This unit is used mainly for livestock grazing. It is also used for vineyards, hay and pasture, and homesite development.

The production of forage is limited by the susceptibility of the soil to compaction when moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly wild oat, soft chess, and filaree.

The main crop grown on this unit is wine grapes. Irrigation commonly is used for maximum production. The very slow permeability and the hazard of erosion are the main limitations. Because of the very slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of a cover crop between rows of vines and trees helps to control erosion. All tillage should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for hay and pasture, the main limitations are very slow permeability and the hazard of erosion. Because of the very slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

If this unit is used for homesite development, the main limitations are very slow permeability, high shrink-swell potential of the subsoil, and low load bearing capacity. If the unit is used for septic tank absorption fields, the limitation of very slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The shrink-swell potential and low load bearing capacity of the soil should be considered when designing and constructing foundations, concrete structures, and paved areas. The effect of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads or streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IIIe-3 (14), irrigated and nonirrigated.

243—Wappo loam, 8 to 15 percent slopes. This very deep, moderately well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation in areas not cultivated is mainly annual grasses and forbs with scattered blue oaks. Elevation is 1,450 to 1,650 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 57 to 59 degrees F, and the average frost-free period is 160 to 205 days.

Typically, the surface layer is brown loam 10 inches thick. The upper 24 inches of the subsoil is strong brown clay, and the lower 17 inches is reddish yellow clay loam and sandy clay loam. The substratum to a depth of 63 inches is light yellowish brown clay loam. In some areas the surface layer is clay loam.

Included in this unit are small areas of Forbesville and Manzanita soils. Also included are small areas of soils that are similar to this Wappo soil but have slopes of 15 to 30 percent, are 20 to 40 inches deep over sedimentary rock and are on convex ridges and side slopes, have less clay in the subsoil, have redder colors, or have 15 to 35 percent gravel in the substratum. This unit is dissected by numerous drainageways 1 foot to 10 feet deep. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wappo soil is very slow. Available water capacity is 6 to 8 inches. Effective rooting depth is 60 inches or more. The clay layer in the subsoil may restrict root penetration. Surface runoff is rapid, and the hazard of erosion is moderate. The shrink-swell potential in the subsoil is high.

This unit is used mainly for livestock grazing. It is also used for vineyards, hay and pasture, and homesite development.

The production of forage is limited by the susceptibility of the soil to compaction when moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. The soil in this unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly wild oat, soft chess, and filaree.

The main crop grown on this unit is wine grapes. Irrigation commonly is used for maximum production. The hazard of erosion, steepness of slope, and very slow permeability are the main limitations. Because of the very slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of a cover crop between rows of vines helps to control erosion. All tillage

should be on the contour or across the slope. Tillage should be kept to a minimum.

If this unit is used for hay and pasture, the main limitations are the hazard of erosion and very slow permeability. Because of the very slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

If this unit is used for homesite development, the main limitations are very slow permeability, high shrink-swell potential in the subsoil, and low load bearing capacity. If this unit is used for septic tank absorption fields, the limitation of very slow permeability can be minimized by increasing the size of the absorption field or by using a specially designed sewage disposal system. The shrink-swell potential and low load bearing capacity of the soil in this unit should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads or streets, it can be mixed with sand and gravel to increase its strength and stability.

This map unit is in capability unit IVe-1 (14), irrigated and nonirrigated.

244—Wappo Variant clay loam, 2 to 8 percent slopes. This very deep, moderately well drained soil is on terraces. It formed in alluvium derived from mixed rock sources. The vegetation is mainly annual grasses and scattered brush and oaks. Elevation is 1,400 to 1,650 feet. The average annual precipitation is 25 to 35 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 200 days.

Typically, the surface layer is yellowish red clay loam 4 inches thick. The upper 11 inches of the subsoil is yellowish red clay, and the lower 69 inches is yellowish red gravelly and very gravelly clay loam. In some areas the surface layer is loam.

Included in this unit are small areas of Forbesville and Neice soils. Also included are small areas of soils that are similar to this Wappo Variant soil but have yellower colors in the subsoil. Included areas make up about 30 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Wappo Variant soil is very slow. Available water capacity is 4.5 to 5.5 inches. Effective rooting depth is 60 inches or more. The clay layer in the subsoil can restrict root penetration. Surface runoff is medium, and the hazard of erosion is moderate. The shrink-swell potential is high in the subsoil.

This unit is used mainly for livestock grazing and hay and pasture. It is also used for homesite development.

The production of forage is limited by the susceptibility of the soil to compaction by livestock when moist. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess and wild oat.

If this unit is used for hay and pasture, the main limitations are very slow permeability and the hazard of erosion. Because of the very slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

If this unit is used for homesite development, the main limitations are very slow permeability, high shrink-swell potential in the subsoil, and low load bearing capacity. Increasing the size of the absorption field or using a specially designed sewage disposal system can help to compensate for the very slow permeability. The shrink-swell potential and low load bearing capacity of the soil in this unit should be considered when designing and constructing foundations, concrete structures, and paved areas. The effects of shrinking and swelling can be reduced by maintaining a constant soil moisture content around the foundation area and by backfilling with material that has low shrink-swell potential. If the soil in this unit is used as a base for roads or streets, it can be mixed with sand or gravel to increase its strength and stability.

This map unit is in capability unit IIIe-3 (14), irrigated and nonirrigated.

245—Whispering-Collayomi complex, 50 to 75 percent slopes. This map unit is on mountains. The vegetation is mainly conifers and oaks with an understory of shrubs. Elevation is 3,000 to 4,600 feet. The average annual precipitation is 50 to 65 inches, the average annual air temperature is 50 to 55 degrees F, and the average frost-free period is 120 to 160 days.

This unit is about 50 percent Whispering loam, 25 percent Collayomi very gravelly loam, and 15 percent Collayomi stony loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Rock outcrop near ridgetops. Also included are small areas of Collayomi and Whispering soils that have slopes of less than 50 percent and soils that are similar to the Collayomi soil but are less than 60 inches deep or have slopes of more than 75 percent. Included areas make up about 10 percent of the total acreage. The percentage varies from one area to another.

The Whispering soil is moderately deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 5 percent of the surface is covered with stones and boulders and a mat of pine needles, leaves, and twigs 1 inch thick. The surface layer is brown loam 5 inches thick. The upper 10 inches of the subsoil is reddish yellow gravelly loam, and the lower 11 inches is yellowish red very cobbly clay loam. Hard, fractured andesite is at a depth of 26 inches.

Permeability of the Whispering soil is moderate. Available water capacity is 2 to 5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

The Collayomi very gravelly loam is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 10 percent of the surface is covered with stones and boulders. The surface layer is light brown very gravelly loam 15 inches thick. The upper 35 inches of the subsoil is light brown and reddish yellow very gravelly loam, and the lower 10 inches is light reddish brown extremely gravelly loam.

Permeability of the Collayomi very gravelly loam is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

The Collayomi stony loam is very deep and well drained. It formed in material weathered from andesite, basalt, or dacite. Typically, 20 percent of the surface is covered with stones and boulders. The surface layer is pinkish gray stony loam 12 inches thick. The next layer is pinkish gray stony loam 8 inches thick. The upper 24 inches of the subsoil is light reddish brown very cobbly clay loam, and the lower 24 inches is reddish yellow very cobbly loam. In some areas the surface layer is cobbly loam.

Permeability of the Collayomi stony loam is moderate. Available water capacity is 2.5 to 4.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe.

This unit is used mainly as wildlife habitat and watershed. It is also used for timber production.

Ponderosa pine, California black oak, and sugar pine are the main tree species on this unit. On the basis of a 100-year site curve, the mean site index for ponderosa pine is 122 on the Collayomi soils and 109 on the Whispering soil. The potential annual production of ponderosa pine on the Whispering soil is 455 board feet per acre from a fully stocked, unmanaged stand of trees. The potential annual production of ponderosa pine on the Collayomi soils is 595 board feet per acre from a fully stocked, unmanaged stand of trees. Estimates of the site index and yield for sugar pine and California black oak have not been made.

The main limitation for the harvesting of timber is steepness of slope, which limits the use of wheeled and tracked equipment in skidding. Cable yarding systems generally disturb the soil less. Stones and boulders on the surface hinder harvesting in some areas. Roads may fail and landslides may occur if deep road cuts are made. Revegetation of cut and fill slopes is difficult on this unit because of the high content of rock fragments and the restricted available water capacity. Rock for construction of roads generally is available on this unit.

Seedling establishment is a concern in the production of timber. Reforestation can be accomplished by planting ponderosa pine seedlings. If seed trees are present, natural reforestation of cutover areas by ponderosa pine occurs periodically. Stones and boulders on the surface limit the even distribution of reforestation.

Among the common forest understory plants are squawcarpet, coffeeberry, poison-oak, brackenfern, manzanita, and perennial grasses.

This map unit is in capability subclass VIIs (5), nonirrigated.

246—Wolfcreek gravelly loam. This very deep, well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation is mainly annual grasses and forbs. Elevation is 1,300 to 2,600 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is pale brown gravelly loam 10 inches thick. The underlying material to a depth of 72 inches is stratified, brown clay loam, sandy clay loam, and very gravelly sandy clay loam.

Included in this unit are small areas of Talmage soils. Also included are small areas of soils that are similar to this Wolfcreek soil but are nongravelly, have a darker colored surface layer and more clay, or are in low areas that are subject to occasional flooding. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wolfcreek soil is moderately slow. Available water capacity is 7.5 to 10.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. This soil is subject to rare periods of flooding during prolonged, high-intensity storms.

This unit is used mainly for livestock grazing and hay and pasture. It is also used for homesite development.

The production of forage is limited by the susceptibility of the soil to compaction when moist. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community on this unit is mainly soft chess, filaree, and burclover.

This unit is well suited to hay and pasture.

If this unit is used for homesite development, the main limitations are moderately slow permeability and the hazard of flooding. Increasing the size of the septic tank absorption fields can help to compensate for the

moderately slow permeability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability units IIs-4 (14), irrigated, and IIIs-4 (14), nonirrigated.

247—Wolfcreek loam. This very deep, well drained soil is on flood plains. It formed in alluvium derived from mixed rock sources. Slope is 0 to 2 percent. The vegetation is mainly annual grasses and forbs. Elevation is 1,300 to 2,600 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 205 days.

Typically, the surface layer is pale brown loam 7 inches thick. The upper 39 inches of the underlying material is brown clay loam and sandy clay loam, and the lower part to a depth of 72 inches is brown very gravelly sandy clay loam.

Included in this unit are small areas of Still soils. Also included are small areas of soils that are gravelly sandy loam throughout the profile. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of this Wolfcreek soil is moderately slow. Available water capacity is 7.5 to 10.0 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and the hazard of erosion is slight. This soil is subject to rare periods of flooding during prolonged, high-intensity storms.

This unit is used mainly for livestock grazing and hay and pasture. It is also used for homesite development.

The production of forage is limited by the susceptibility of the soil in this unit to compaction when moist. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The characteristic plant community is mainly soft chess, filaree, and burclover.

This unit is well suited to hay and pasture.

If this unit is used for homesite development, the main limitations are moderately slow permeability and the hazard of flooding. Increasing the size of the septic tank absorption fields can help to compensate for the moderately slow permeability. Dikes and channels that have outlets for floodwater can be used to protect buildings and onsite sewage disposal systems from flooding. Roads and streets should be located above the expected flood level.

This map unit is in capability class I (14), irrigated, and capability unit IIIc-1 (14), nonirrigated.

248—Xerofluvents, very gravelly. This map unit consists of very deep, excessively drained soils on narrow flood plains adjacent to stream channels. These soils formed in alluvium derived from mixed rock sources, dominantly sandstone or shale. Slope is 0 to 2 percent. The vegetation is mainly sparse annual grasses and forbs. Elevation is 750 to 1,500 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 145 to 200 days.

No single profile of Xerofluvents is typical, but one commonly observed in the survey area has a surface layer of grayish brown very gravelly sandy loam 5 inches thick. The underlying material to a depth of 84 inches is stratified, light brownish gray very gravelly loamy coarse sand and very gravelly coarse sand. In some areas the surface layer is sandy loam or gravelly sandy loam.

Included in this unit are small areas of Kelsey, Still, and Talmage soils. Also included are small areas of Xerofluvents that have slopes of 2 to 5 percent. Included areas make up about 35 percent of the total acreage. The percentage varies from one area to another.

Permeability of these soils is rapid. Available water capacity is 1.5 to 2.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and there is no hazard of erosion except in areas along streams that are subject to severe streambank erosion during high-intensity storms. These soils are subject to occasional periods of flooding in winter and spring.

This unit is used mainly for livestock grazing. It is also used as a source of commercial gravel.

This unit is poorly suited to livestock grazing because of the restricted available water capacity. It supports very sparse stands of plants that are suitable for grazing. The herbaceous plant cover readily deteriorates if it is overgrazed. To control erosion and provide wildlife habitat, vegetation should not be removed. The characteristic plant community on this unit is mainly vinegarweed, foxtail fescue, and filaree.

The removal of aggregate can lower the level of streambeds and widen stream channels. This can undermine structures, lower the water table adjacent to the stream channel, and result in the erosion of streambanks, thereby increasing sedimentation downstream. Check dams or buried sills can be used to control the lowering of streambeds. Jetties or other structures can be placed in stream channels to protect banks from erosion.

This map unit is in capability subclass VIIs (14), nonirrigated.

249—Xerofluvents-Riverwash complex. This map unit is on narrow flood plains adjacent to stream channels and in active stream channels. Slope is 0 to 2 percent. The vegetation is mainly sparse annual grasses and forbs. Elevation is 750 to 2,800 feet. The average annual precipitation is 25 to 40 inches, the average annual air temperature is 54 to 59 degrees F, and the average frost-free period is 135 to 200 days.

This unit is about 55 percent Xerofluvents and 30 percent Riverwash. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Kelsey, Maywood Variant, and Talmage soils. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Xerofluvents consist of very deep, excessively drained soils that formed in alluvium derived from mixed rock sources. No single profile of Xerofluvents is typical, but one commonly observed in the survey area has a surface layer of grayish brown very gravelly sandy loam 5 inches thick. The underlying material to a depth of 84 inches is stratified, light brownish gray very gravelly loamy coarse sand and very gravelly coarse sand.

Permeability of these soils is rapid. Available water capacity is 1.5 to 2.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very slow, and there is no hazard of erosion except along streams where there is severe streambank erosion during high-intensity storms. These soils are subject to frequent flooding in winter and spring.

Riverwash is very deep water-deposited sediment consisting of sand, gravel, cobbles, and stones in active stream channels.

This unit is used mainly for livestock grazing and wildlife habitat. It is also used for as a source of commercial gravel.

This unit is poorly suited to livestock grazing because of the restricted available water capacity. It supports very sparse stands of plants that are suitable for grazing. The herbaceous plant cover readily deteriorates if overgrazed. Vegetation should be retained on the soil to reduce erosion and provide wildlife habitat. The characteristic plant community on this unit is mainly foxtail fescue, vinegarweed, and filaree.

The removal of aggregate can lower the level of streambeds and widen stream channels. This can undermine structures, lower the water table adjacent to the stream channel, and result in the erosion of streambanks, thereby increasing sedimentation downstream. Erosion of streambanks can also result in the loss of valuable agricultural land. Jetties or other structures can be placed in stream channels to prevent the channels from widening. Check dams or sills can be used to control the downcutting of streambeds.

This map unit is in capability class VIII (14), nonirrigated.

250—Yollabolly-Freezeout very gravelly sandy loams, 30 to 50 percent slopes. This map unit is on mountaintops. The vegetation is mainly conifers and shrubs. Elevation is 5,000 to 7,000 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 43 to 48 degrees F, and the average frost-free period is 90 to 130 days.

This unit is about 50 percent Yollabolly very gravelly sandy loam and 30 percent Freezeout very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Neuns, and Sheetiron soils and areas of debris slopes that are associated with Rock outcrop and are devoid of vegetation. Also included are small areas of Freezeout and Yollabolly soils that have slopes of less than 30 percent. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Yollabolly soil is shallow and excessively drained. It formed in material weathered from metamorphosed sandstone. The surface layer is brown very gravelly sandy loam about 5 inches thick. The underlying material is pale brown extremely gravelly sandy loam about 9 inches thick. Metamorphosed sandstone is at a depth of 14 inches.

Permeability of the Yollabolly soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

The Freezeout soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed conifer needles, twigs, and bark 1 inch thick. The surface layer is dark grayish brown very gravelly sandy loam 5 inches thick. The upper 11 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 9 inches is yellowish brown very gravelly sandy loam. Hard metamorphosed sandstone is at a depth of 25 inches.

Permeability of the Freezeout soil is moderately rapid. Available water capacity is 2 to 3 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is moderate.

This unit is used mainly as watershed and wildlife habitat. It is also used for timber production.

White fir, Jeffrey pine, and California red fir are the main tree species on this unit. Among the trees of limited extent are sugar pine, incense-cedar, and Douglas-fir. On the basis of a 50-year site curve, the mean site index is 53 for white fir on the Freezeout soil. Estimates of the site index and yield for the Yollabolly soil have not been made because the vegetation is mostly brush. The potential annual production of white fir on the Freezeout soil is 565 board feet (International rule, one-eighth inch kerf) per acre from a fully stocked stand of trees. Areas of Rock outcrop reduce the yield substantially. Conifer stands commonly are small and widely scattered, making many areas noncommercial.

A concern for the harvesting of timber is steepness of slope. Snowpack limits the use of equipment and restricts access. Revegetation of cut and fill slopes is difficult on this unit because of the high content of rock

fragments in the soil and the restricted available water capacity. Rock for construction of roads is available on this unit.

Seedling survival is a concern in the production of timber on this unit. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. The mortality rate of seedlings is higher on ridgetops that are subject to strong, persistent winds than in other areas of this unit. Even where seed trees are present, natural reforestation of cutover areas by conifers occurs infrequently. Reforestation can be accomplished by planting large seedlings. Areas of Rock outcrop limit the even distribution of reforestation. Planting on the Yollabolly soil is not practical because of the large amount of rock fragments on the surface and in the soil.

Among the common forest understory plants are buckleberry oak, whitethorn, and lupine.

This map unit is in capability subclass VIIs (5), nonirrigated.

251—Yollabolly-Rock outcrop-Freezeout complex, 50 to 75 percent slopes. This map unit is on mountaintops. The vegetation is mainly shrubs with a few conifers. Elevation is 5,000 to 7,050 feet. The average annual precipitation is 50 to 70 inches, the average annual air temperature is 43 to 48 degrees F, and the average frost-free period is 90 to 130 days.

This unit is about 35 percent Yollabolly very gravelly sandy loam, 30 percent Rock outcrop, and 20 percent Freezeout very gravelly sandy loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Deadwood, Sheetiron, and Neuns soils. Also included are small areas of debris slopes that are associated with Rock outcrop and are devoid of vegetation and small areas of Freezeout and Yollabolly soils that have slopes of less than 50 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Yollabolly soil is shallow and excessively drained. It formed in material weathered from metamorphosed sandstone. The surface layer is brown very gravelly sandy loam about 5 inches thick. The underlying material is pale brown extremely gravelly sandy loam about 9 inches thick. Metamorphosed sandstone is at a depth of 14 inches.

Permeability of the Yollabolly soil is moderate. Available water capacity is 0.5 inch to 2.0 inches. Effective rooting depth is 10 to 20 inches. Surface runoff is very rapid, and the hazard of erosion is severe.

Rock outcrop consists of hard, unweathered sandstone. It occurs as large solid intrusive masses 1 acre to 20 acres in size. Debris slopes that are devoid of vegetation commonly are associated with the Rock outcrop.

The Freezeout soil is moderately deep and well drained. It formed in material weathered from metamorphosed sandstone. Typically, the surface is covered with a mat of partially decomposed needles, twigs, and bark 1 inch thick. The surface layer is dark grayish brown very gravelly sandy loam 5 inches thick. The upper 11 inches of the subsoil is dark brown very gravelly sandy loam, and the lower 9 inches is yellowish brown very gravelly sandy loam. Hard metamorphosed sandstone is at a depth of 25 inches.

Permeability of the Freezeout soil is moderately rapid. Available water capacity is 2 to 3 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly as watershed and wildlife habitat. It is also used for timber production.

White fir, Jeffrey pine, and red fir are the main tree species on this unit. Among the trees of limited extent are sugar pine, incense-cedar, and Douglas-fir. Estimates of the site index and yield for the Yollabolly soil have not been made because the vegetation is mostly brush. On the basis of a 50-year site curve, the mean site index is 53 for white fir on the Freezeout soil. The potential annual production of white fir on the Freezeout soil is 565 board feet (International rule, one-eighth inch kerf) per acre from a fully stocked stand of trees. Areas of Rock outcrop in this unit will reduce the yield substantially. Conifer stands commonly are small and widely scattered, making many areas noncommercial.

The main limitations for the harvesting of timber are steepness of slope and the areas of Rock outcrop. Cable yarding systems generally are used on this unit. Snowpack limits the use of equipment and restricts access. Revegetation of cut and fill slopes is difficult because of the high content of rock fragments in the soil and the restricted available water capacity. Rocks and loose soil material may slide down roadcuts on the Yollabolly and Freezeout soils and thus increase the need for maintenance of roads. Rock for construction of roads is available on this unit.

Seedling survival is a concern in the production and reforestation of timber. The droughtiness of the surface layer reduces the survival rate of seedlings, especially on south- and southwest-facing slopes. The mortality rate of seedlings is higher on ridgetops that are subject to strong, persistent winds than in other areas of this unit. Movement of loose surface material can reduce seedling survival on the Yollabolly soil. Even when seed trees are present, natural reforestation of cutover areas by conifers occurs infrequently. Reforestation can be accomplished by planting large seedlings. Areas of Rock outcrop limit the even distribution of reforestation. Planting on the Yollabolly soil is not practical because of the large number of rocks on the surface and in the soil.

Among the common forest understory plants are huckleberry oak, whitethorn, and lupine.

This map unit is in capability subclass VIIs (5), nonirrigated.

252—Yorktree-Hopland-Squawrock complex, 15 to 50 percent slopes. This map unit is on hills and mountains. The Yorktree soil is unstable and commonly is subject to slumping. The vegetation is mainly oaks and annual grasses on the Yorktree and Hopland soils and annual grasses and forbs with a few scattered oaks on the Squawrock soil. Elevation is 1,800 to 3,000 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature 54 to 59 degrees F, and the average frost-free period is 145 to 195 days.

This unit is about 30 percent Yorktree clay loam, 30 percent Hopland loam, and 15 percent Squawrock gravelly loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Etsel, Mayacama, Maymen, Pomo, and Yorkville soils and Rock outcrop. The areas of Rock outcrop are on ridges. Also included are small areas of soils that are similar to the Yorktree soil but have higher base saturation. Included areas make up about 25 percent of the total acreage. The percentage varies from one area to another.

The Yorktree soil is deep and well drained. It formed in material weathered from graywacke, schist, or shale. Typically, the surface layer is grayish brown clay loam 8 inches thick. The upper 16 inches of the subsoil is grayish brown clay loam, the next 10 inches is olive gray gravelly clay, and the lower 21 inches is very dark gray gravelly clay. Hard, fractured graywacke is at a depth of 55 inches.

Permeability of the Yorktree soil is very slow. Available water capacity is 5.5 to 9.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is very rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Hopland soil is moderately deep and well drained. It formed in material weathered from sandstone or shale. Typically, the surface layer is brown loam 6 inches thick. The upper 9 inches of the subsoil is brown loam, and the lower 19 inches is light brown clay loam. Soft, highly weathered sandstone is at a depth of 34 inches.

Permeability of the Hopland soil is moderately slow. Available water capacity is 3 to 7 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

The Squawrock soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown gravelly loam 8 inches thick. The subsoil is light brownish gray very gravelly clay loam 29 inches thick. Hard, fractured sandstone is at a depth of 37 inches.

Permeability of the Squawrock soil is moderate. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed. It can be used for firewood production.

The production of forage is limited by the susceptibility to compaction by livestock when moist and a dense canopy cover on the Yorktree soil and by the restricted available water capacity of the Squawrock soil. The Hopland soil supports sparse stands of plants that are suitable for grazing. Because of the instability of the Yorktree soil, trees should be retained. Grazing should be delayed until the Yorktree soil has drained sufficiently to withstand trampling by livestock.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Springs and seeps are common on the Yorktree soil. They can be developed as watering facilities for wildlife and to achieve better livestock distribution. Livestock grazing should be managed to protect the soil from erosion. The characteristic plant community on the Squawrock soil is mainly wild oat, soft chess, and filaree. Among the common understory plants on the Yorktree soil are melicgrass, blue wildrye, and buttercup.

This map unit is in capability subclass VIe (15), nonirrigated.

253—Yorkville-Pomo complex, 15 to 50 percent slopes. This map unit is on hills and mountains. The vegetation is mainly annual grasses and forbs with a few scattered oaks. The soils in this unit are unstable and are very susceptible to slumping. Rotational slips and hummocky microrelief are common. Elevation is 1,600 to 3,000 feet. The average annual precipitation is 30 to 40 inches, the average annual air temperature is 56 to 59 degrees F, and the average frost-free period is 160 to 195 days.

This unit is about 45 percent Yorkville clay loam and 40 percent Pomo loam. The components of this unit are so intricately intermingled that it was not practical to map them separately at the scale used.

Included in this unit are small areas of Bressa, Millsholm, and Skyhigh soils. Also included are small areas of Pomo and Yorkville soils that have slopes of less than 30 percent. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

The Yorkville soil is very deep and moderately well drained. It formed in material weathered from graywacke, schist, or shale. Typically, the surface layer is dark gray clay loam 3 inches thick. The upper 30 inches of the subsoil is dark gray and gray clay, and the lower 31 inches is gray gravelly clay loam. Hard, fractured schist is at a depth of 64 inches.

Permeability of the Yorkville soil is very slow. Available water capacity is 6.0 to 13.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Pomo soil is deep and well drained. It formed in material derived from sandstone. Typically, the surface layer is yellowish brown loam 11 inches thick. The subsoil is yellowish brown and dark yellowish brown gravelly loam 29 inches thick. The substratum to a depth of 58 inches is dark yellowish brown very gravelly clay loam. Fractured, weathered sandstone is at a depth of 58 inches.

Permeability of the Pomo soil is moderately slow. Available water capacity is 4.0 to 8.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by the susceptibility of the soil to compaction by livestock when moist. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. This unit responds well to fertilizer, rangeland seeding, and proper grazing use. The main limitation for seeding is steepness of slope.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Springs and seeps are common on this unit. They can be developed as watering facilities for wildlife and to achieve better livestock distribution. Livestock grazing should be managed to protect the unit from erosion. The characteristic plant community on this unit is mainly soft chess, purple needlegrass, and wild oat.

This map unit is in capability subclass VIe (15), nonirrigated.

254—Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes. This map unit is on hills and mountains. The soils in this unit are unstable. Slumps and a hummocky relief are common. The vegetation is mainly annual grasses and forbs with a few scattered oaks on the Yorkville and Squawrock soils and oaks and annual grasses on the Yorktree soil. Elevation is 1,800 to 3,500 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 54 to 59 degrees F, and the average frost-free period is 145 to 195 days.

This unit is about 45 percent Yorkville clay loam, 20 percent Yorktree clay loam, and 15 percent Squawrock gravelly loam. The Yorkville soil is on concave slopes, the Yorktree soil is on convex slopes and in drainageways, and the Squawrock soil is on convex spur ridges surrounding rock outcroppings and in drainageways.

Included in this unit are small areas of Hopland, Mayacama, and Pomo soils and Rock outcrop. Also included are small areas of Yorkville, Squawrock, and Yorktree soils that have slopes of less than 15 percent, soils that are similar to the Yorkville soil but are 20 to 40 inches deep, and soils that are similar to the Yorktree soil but have a higher base saturation. Included areas make up about 20 percent of the total acreage. The percentage varies from one area to another.

The Yorkville soil is very deep and moderately well drained. It formed in material weathered from graywacke, schist, or shale. Typically, the surface layer is dark gray clay loam 3 inches thick. The upper 30 inches of the subsoil is dark gray and gray clay, and the lower 31 inches is gray gravelly clay loam. Hard, fractured schist is at a depth of 64 inches.

Permeability of the Yorkville soil is very slow. Available water capacity is 8.5 to 13.5 inches. Effective rooting depth is 60 inches or more. Surface runoff is very rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Yorktree soil is deep and well drained. It formed in material weathered from graywacke, schist, or shale. Typically, the surface layer is grayish brown clay loam 8 inches thick. The upper 16 inches of the subsoil is grayish brown clay loam, the next 10 inches is olive gray gravelly clay, and the lower 21 inches is very dark gray gravelly clay. Hard, fractured schist is at a depth of 55 inches.

Permeability of the Yorktree soil is very slow. Available water capacity is 5.5 to 9.5 inches. Effective rooting depth is 40 to 60 inches. Surface runoff is very rapid, and the hazard of erosion is severe. The shrink-swell potential is high.

The Squawrock soil is moderately deep and well drained. It formed in material weathered from sandstone. Typically, the surface layer is grayish brown gravelly loam 8 inches thick. The subsoil is light brownish gray very gravelly clay loam 29 inches thick. Hard, fractured sandstone is at a depth of 37 inches.

Permeability of the Squawrock soil is moderate. Available water capacity is 1.5 to 4.5 inches. Effective rooting depth is 20 to 40 inches. Surface runoff is rapid, and the hazard of erosion is severe.

This unit is used mainly for livestock grazing, wildlife habitat, and watershed.

The production of forage is limited by the susceptibility of the Yorkville and Yorktree soils to compaction when moist, a dense canopy cover on the Yorktree soil, and the restricted available water capacity of the Squawrock soil. Grazing should be delayed until the soil has drained sufficiently to withstand trampling by livestock. Because of the instability of the Yorktree soil, trees should be retained. The Yorkville and Squawrock soils respond well to fertilizer, rangeland seeding, and proper grazing use. The main limitation for seeding is steepness of slope.

Slope limits access by livestock and results in overgrazing of the less sloping areas. Fencing and properly locating salt and livestock watering facilities promote uniform distribution of livestock grazing. Springs and seeps are common on this unit. They can be developed as watering facilities for wildlife and to achieve better livestock distribution. The characteristic plant community on the Yorkville and Squawrock soils is mainly soft chess and wild oat. Among the common understory plants on the Yorktree soil are melicgrass, blue wildrye, and buttercup.

This map unit is in capability subclass VIe (15), nonirrigated.

255—Yorkville Variant clay loam, 2 to 8 percent slopes. This very deep, well drained soil is on alluvial fans, landslips, and toe slopes. It formed in alluvium and colluvium derived dominantly from serpentinitic rock. The vegetation in areas not cultivated is mainly annual grasses and forbs. Elevation is 800 to 2,250 feet. The average annual precipitation is 35 to 50 inches, the average annual air temperature is 55 to 59 degrees F, and the average frost-free period is 150 to 200 days.

Typically, the surface layer is reddish brown clay loam 8 inches thick. The upper 23 inches of the subsoil is dark reddish brown gravelly sandy clay, and the lower 31 inches is brown and yellowish red clay. The substratum to a depth of 71 inches is brownish yellow sandy clay loam.

Included in this unit are small areas of Lupoyoma soils. Also included are soils that are similar to this Yorkville Variant soil but have slopes of more than 8 percent or that have more gravel in the subsoil and fine textured, brownish or grayish soils that are on alluvial fans, have slopes of 0 to 5 percent, and are in areas southeast of Detert Reservoir and to the south of Grange Road. Included areas make up about 15 percent of the total acreage. The percentage varies from one area to another.

Permeability of the Yorkville Variant soil is slow. Available water capacity is 6.5 to 8.0 inches. Rooting depth is 60 inches or more. Growth of many plants is limited by an unfavorable calcium to magnesium ratio. Surface runoff is medium, and the hazard of erosion is moderate.

This unit is used mainly for livestock grazing. It is also used for hay and pasture and homesite development.

The production of forage is limited by the unfavorable calcium to magnesium ratio and by the susceptibility of the soil to compaction when wet. Grazing should be delayed until the soil has drained sufficiently and is firm enough to withstand trampling by livestock. Rangeland seeding and fertilization on this unit generally are not practical because of the serpentinitic influence. The characteristic plant community on this unit is mainly soft chess, bottlebrush squirreltail, and danthonia.

This unit is poorly suited to hay and pasture. The main limitations are the unfavorable calcium to magnesium ratio, slow permeability, and the hazard of erosion. Growth of many plants is limited by the low calcium to magnesium ratio. Overcoming this limitation is not economically feasible because of the large amount of calcium needed. Because of the slow permeability, irrigation water needs to be applied slowly to minimize runoff. Use of proper stocking rates, pasture rotation, and restricted grazing during wet periods helps to keep the pasture in good condition and to protect the soil from erosion. Erosion is reduced if tillage and seeding are on the contour or across the slope.

If this unit is used for homesite development, the main limitations are slow permeability. Increasing the size of the septic tank absorption field or using a specially designed disposal system can help to compensate for the slow permeability.

This map unit is in capability unit IIIe-9 (14), irrigated and nonirrigated.

Prime Farmland

In this section, prime farmland is defined and discussed and the prime farmland soils in this survey area are listed.

Prime farmland is of major importance in providing the nation's short- and long-range needs for food and fiber. The acreage of high-quality farmland is limited, and the U.S. Department of Agriculture recognizes that government at local, state, and federal levels, as well as individuals, must encourage and facilitate the wise use of our nation's prime farmland.

Prime farmland soils, as defined by the U.S. Department of Agriculture, are soils that are best suited to producing food, seed, forage, fiber, and oilseed crops. Such soils have properties that are favorable for the economic production of sustained high yields of crops. The soils need only to be treated and managed using acceptable farming methods. Adequate moisture and a sufficiently long growing season are required. Prime farmland soils produce the highest yields with minimal inputs of energy and economic resources, and farming these soils results in the least damage to the environment.

Prime farmland soils may presently be in use as cropland, pastureland, or woodland, or they may be in other uses. They either are used for producing food and fiber or are available for these uses. Urban or built-up land, public land, and water areas cannot be considered prime farmland. Urban or built-up land is any contiguous unit of land 10 acres or more in size that is used for such purposes as housing, industrial, and commercial sites, sites for institutions or public buildings, small parks, golf courses, cemeteries, railroad yards, airports, sanitary landfills, sewage treatment plants, and water control structures. Public land is land not available for farming in national forests, national parks, military reservations, and state parks.

Prime farmland soils commonly get an adequate and dependable supply of moisture from precipitation or irrigation. Temperature and length of growing season are favorable, and level of acidity or alkalinity is acceptable. The soils have few, if any, rocks and are permeable to water and air. They are not excessively erodible or saturated with water for long periods and are not flooded during the growing season. The slope ranges mainly from 0 to 6 percent.

Soils that have a high water table, are subject to flooding, or are droughty may qualify as prime farmland soils if the limitations are overcome by drainage, flood control, or irrigation. Onsite evaluation is necessary to determine the effectiveness of corrective measures. More information on the criteria for prime farmland soils can be obtained at the local office of the Soil Conservation Service.

A recent trend in land use has been the conversion of prime farmland to urban and industrial uses. The loss of prime farmland to other uses puts pressure on lands that are less productive than prime farmland.

About 38,615 acres, or nearly 5 percent, of the survey area would meet the requirements for prime farmland if an adequate and dependable supply of irrigation water were available.

The following map units meet the soil requirements for prime farmland when irrigated. On some soils included in the list, measures should be used to overcome a hazard or limitation, such as flooding, wetness, or droughtiness. The location of each map unit is shown on the detailed soil maps with this publication. Soil qualities that affect use and management are described in the section "Detailed Soil Map Units." This list does not constitute a recommendation for a particular land use.

121 Clear Lake clay, drained, cool
123 Cole clay loam, drained
124 Cole Variant clay loam
125 Cole Variant clay loam, calcareous substratum
132 Forbesville loam, 2 to 5 percent slopes
144 Jafa loam, 2 to 5 percent slopes
147 Kelsey fine sandy loam
150 Kilaga Variant loam, 0 to 5 percent slopes
157 Landlow Variant silty clay loam (if drained)
158 Lupoyoma silt loam, protected
159 Manzanita loam, 2 to 5 percent slopes
176 Maywood Variant sandy loam
180 Mocho Variant loam
194 Oxalis Variant silt loam
232 Still loam
233 Still loam, stratified substratum
234 Still gravelly loam
238 Tulelake silty clay loam, flooded (if protected from flooding)
239 Tulelake silty clay loam, protected
246 Wolfcreek gravelly loam
247 Wolfcreek loam

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help avoid soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, foresters, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and woodland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreation facilities; and for wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

Larry A. Day, agronomist, and Robert D. German, soil conservationist, Soil Conservation Service, helped to prepare this section.

General management needed for crops and for hay and pasture is suggested in this section. The system of land capability classification used by the Soil Conservation Service and the Storie index used by the University of California Agricultural Experiment Station are explained, and the estimated yields of the main crops and hay and pasture plants commonly grown are listed for each soil.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under "Detailed Soil Map Units." Specific information can be obtained from the local office of the Soil Conservation Service or the Cooperative Extension Service.

In 1981 about 40,000 acres in the survey area was used for crops and pasture. Of this total, about 8,800 acres was used for English walnuts, about 5,700 acres for pears, about 5,000 acres for irrigated pasture, and about 2,700 acres for wine grapes. Pears accounted for about one-half of the gross income derived from agriculture during that year. Other fruit and nut crops included almonds, black walnuts, kiwi fruit, and prunes. Field crops grown included alfalfa, barley, corn sorghum, nonirrigated hay and pasture, oats, rice, safflower, sunflower, wheat, and wild rice.

The lack of precipitation in summer necessitates the irrigation of some crops to achieve maximum production. Protection from frost is often required to prevent damage to fruit crops early in spring and fall. Ground water is the source of most of the water used for irrigation and protection from frost.

Both irrigated and nonirrigated walnuts are grown in the survey area. Irrigated walnuts are grown dominantly on the valley bottom lands and nonirrigated walnuts on the surrounding terraces and hills.

Lake County currently produces one-half of California's fresh market pear crop. Pear decline, a mycoplasma disease spread by the insect vector pear psylla, struck the pear industry in the county in the 1960's and significantly reduced yields in affected orchards. Control of pear psylla by pesticide application, development of resistent rootstock, and treatment of affected trees by injection with terramycin has resulted in a return to pre-pear decline levels of production.

The acreage planted to wine grapes in the county has been steadily increasing since the mid-1970's.

Many of the very deep, nearly level soils on the alluvial bottom lands are well suited to crops and pasture. Cole, Clear Lake, Kelsey, Lupoyoma, and Still soils are examples. Tulelake and Landlow Variant soils are not suited to fruit and nut crops because of poor drainage and a high water table; they are used for hay and

pasture and field crops. Maxwell soils have a low calcium to magnesium ratio and are poorly suited to fruit and nut crops. San Joaquin Variant soils have a hardpan that restricts root penetration. Talmage soils have a high content of rock fragments and therefore have low available water capacity. Wolfcreek and Kilaga Variant soils are suited to production of fruit and nuts but commonly are not used for these crops, primarily because an irrigation water supply has not been developed.

The soils on the terraces in Big Valley are suited to the production of walnuts, wine grapes, and hay and pasture. These are the Forbesville, Wappo, and Manzanita soils. These terrace soils are well suited to wine grapes because of good soil drainage and favorable air drainage, which reduces the risk of frost.

Some soils in the more gently sloping areas of the hills in the Clear Lake volcanic field also are suited to the production of walnuts and wine grapes. These soils include those of the Aiken, Benridge, Bottlerock, Glenview, and Sodabay series. Small areas of these soils are used for dryland walnuts. They have potential for wine grapes but have not yet been widely developed for this use mainly because an irrigation water supply has not been developed and because additional effort is involved in developing hillside vineyards and controlling erosion on them.

In the paragraphs that follow, the main management practices for the soils in the survey area that are suited to field crops and pasture are briefly discussed. The major concerns when farming the soils are maintaining and improving their production capacity and controlling erosion. Needed management practices include proper tillage, cover crops, crop residue use, erosion control, irrigation water management, removal of excess water, and pasture management.

Proper tillage is limiting the number of operations to the minimum necessary to control weeds, incorporate crop residue, obtain favorable air and water movement in the soil, and prepare an adequate seedbed. Excessive tillage breaks down soil structure and reduces the organic matter content of the soil, and heavy tillage implements tend to create a plowpan. These conditions increase the risk of erosion, limit permeability, and restrict root penetration. Varying the tillage depth slows the development of a plowpan, and infrequent shallow chiseling helps to break up the pan. Combining tillage operations to reduce the number of trips over a field and delaying operations while the soils are wet are also important.

Cover crops should be grown in orchards and vineyards and in other areas where the soils are left fallow during the rainy season. Cover crops provide protection from erosion and maintain or improve water penetration, soil tilth, and fertility. Cover crops in the survey area are volunteer native plants or they are seeded.

An annual cover crop that reseeds itself commonly is used under dryland farming. These grasses die early in summer and therefore do not deplete soil moisture during the latter part of the growing season. An annually reseeding grass will grow in winter and spring, providing erosion control. Early in spring the cover crop can be mowed to a height of 3 inches or more to reduce the risk of frost damage to the crop. After viable seed has set, mowing can be performed at a lower height. Seed will be available the following fall to start the annual growth cycle over again.

Perennial cover crops commonly are used in irrigated orchards and vineyards. They require moisture in summer.

Crop residue use helps to maintain soil tilth, organic matter content, and fertility. It also helps to control erosion. On sloping soils where the hazard of erosion is high, residue should be left on or near the surface.

If sufficient residue is not supplied, the tilth of the soil can decline. The soil can be more easily compacted, water infiltration can be slower, and soil aeration can be poor. Growing cover crops, adding prunings from orchards or vineyards, or adding animal manure provides residue that can be used if low residue producing crops are being grown.

Erosion control generally is needed on sloping soils. The steeper or longer the slope, the greater the hazard of erosion. Erosion can be recognized by rills and gullies on the slope or by the accumulation of sediment at the base of the slope, in drainageways, or against fence lines.

Many different practices can be used to control erosion in the survey area. Among these are proper tillage, the use of cover crops, returning crop residue to the soil, cross-slope farming, and selecting the best method of irrigation and controlling irrigation water to reduce erosion of irrigated soils.

Structural measures, used individually or in combination, may also be needed. These could include diversions, grassed waterways, grade stabilization structures, water retention structures, or streambank stabilization structures.

Erosion has been a particular problem in the Red Hills area for soils in dryland walnut production. In many areas these soils have been severely eroded and only a thin surface layer remains. In some places the subsoil has been exposed. Intensive erosion control is needed.

Irrigation water management consists of controlling the rate, amount, and timing of irrigation water applied to soil to meet crop needs. Irrigation water should be applied at a rate sufficient for crop needs but in amounts small enough to prevent excessive runoff or deep percolation. If irrigation is conducted in a planned and efficient manner, soil erosion and plant nutrient losses are minimized, undesirable water loss is controlled, and water quality is protected.

Furrow, border, sprinkler, and drip irrigation methods are used in the survey area. Furrow and border irrigation should be limited to areas where slopes are 3 percent or less. Sprinkler irrigation is suited to all tillable soils in the area. Drip irrigation is suited to orchards and vineyards and is the most efficient system on many soils.

Removal of excess surface water, either from rainfall or irrigation, is a concern in some low-lying areas, in swales, or at the lower end of irrigated fields. It is also needed where a water table exists within the root zone. Excess water results in lower crop production and may provide habitat for weeds and mosquitoes.

Excess water on the surface can be controlled by shaping and grading, proper land smoothing, constructing open drainage ditches, providing subsurface drainage, using irrigation tailwater return systems, and properly managing irrigation water.

Soils in the survey area that may require removal of excess water are Tulelake and Landlow Variant soils. Clear Lake and Clear Lake Variant soils may require subsurface drainage if they are used for deep-rooted perennial crops. In areas of Scotts Valley, soils that do not normally require subsurface drainage are affected by a high water table that developed as the result of ground subsidence because of the depletion of ground water aquifers. These areas may require removal of the excess water.

Management of irrigated pasture is needed to prevent soil compaction, provide maximum production, maintain a desirable plant community, and extend the life of the pasture. Practices necessary in a pasture management program include irrigation water management, rotation grazing, fertilization, harrowing or dragging to scatter droppings, and clipping as necessary to maintain uniform growth. Grazing should begin when plants are 8 to 10 inches high and terminate when 3 to 4 inches of stubble remains.

Yields per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations are also considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green-manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed. The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in table 6 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Soil Conservation Service or of the Cooperative Extension Service can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The grouping does not take into account major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor does it consider possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for woodland, and for engineering purposes.

In the capability system, soils generally are grouped at three levels: capability class, subclass, and unit. These levels are defined in the following paragraphs.

Capability classes, the broadest groups, are designated by Roman numerals I through VIII. The numerals indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class I soils have few limitations that restrict their use.

Class II soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.

Class III soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.

Class IV soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.

Class V soils are not likely to erode but have other limitations, impractical to remove, that limit their use.

Class VI soils have severe limitations that make them generally unsuitable for cultivation.

Class VII soils have very severe limitations that make them unsuitable for cultivation.

Class VIII soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, *e, w, s,* or *c,* to the class numeral, for example, IIe. The letter *e* shows that the main limitation is risk of erosion unless close-growing plant cover is maintained; *w* shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); *s* shows that the soil is limited mainly because it is shallow, droughty, or stony; and *c*, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class I there are no subclasses because the soils of this class have few limitations. Class VIII soils have not been assigned subclasses. They have limitations that preclude their use for commerical plant production and restrict their use to recreation, watershed, wildlife habitat, or esthetic purposes. Class V contains only the subclasses indicated by *w, s,* or *c* because the soils in class V are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, woodland, wildlife habitat, or recreation. Class V soils have not been mapped in this survey.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units generally are designated by adding an Arabic numeral to the subclass symbol, for example, IIe-4 or IIIe-6. The numbers used to designate units within the subclasses are as follows:

0. Indicates limitations caused by stony, cobbly, or gravelly material in the substratum.
1. Indicates limitations caused by slope or by an actual or potential erosion hazard.
2. Indicates a limitation of wetness caused by poor drainage or flooding.
3. Indicates a limitation of slow or very slow permeability of the subsoil or substratum is caused by a clayey subsoil or by a substratum that is semiconsolidated.
4. Indicates a low available water capacity in sandy or gravelly soils.
5. Indicates limitations caused by a fine-textured or very fine-textured surface layer.
6. Indicates limitations caused by salts or alkali.
7. Indicates limitations caused by rocks, stones, or cobblestones.
8. Indicates that the soil has a very low or low available water capacity because the root zone generally is less than 40 inches deep over massive bedrock.
9. Indicates limitations caused by low or very low fertility, acidity, or toxicity that cannot be corrected by adding normal amounts of fertilizer, lime, or other amendments.

No unit designations are shown for class I soils because soil characteristics are similar for all soils in the class. Unit designations are not given for soils in classes V through VIII because these soils normally are not intensively managed as cropland.

The capability classification of each map unit is given in the section "Detailed Soil Map Units."

Land Resource Areas

In Lake County, capability classification is further refined by designating the land resource area in which the soils of a map unit occur. A land resource area is a broad geographic area that has a distinct combination of climate, topography, vegetation, and land use. Parts of three of these nationally designated resource areas are in Lake County. These areas and their numbers are: Siskiyou-Trinity Area (5), Central California Coastal Valleys (14), and Central California Coast Range (15). The number of the resource area follows, in parentheses, the land capability class, subclass, or unit designations for complete identification of the capability classification. An example is IVe-1 (15).

A soil in one resource area may have characteristics similar to those of a soil in another area and have the same capability symbol, but the climate, vegetation, crops that are suited, and the management practices that are needed may differ. For example, both capability subclasses VIe (5) and VIe (15) may have soils that are deep and well drained. The soils in capability subclass VIe (15) are in Central California Coast Range and, because of the climate, are primarily used as rangeland. The soils in capability subclass VIe (5) could be used for grazing but are primarily suited to and used for timber production.

Land resource area 5 is in the northern one-third of Lake County. Most of the area is in the Mendocino National Forest, but there are a few small parcels of privately owned land. The topography is dominantly mountainous with rounded ridges and steep side slopes and includes a few small valleys and lakes. The natural vegetation is mainly forests of Douglas-fir, ponderosa pine, and sugar pine at the lower elevations and commonly is white fir, red fir, and Jeffery pine at elevations of more than 5,000 feet. Elevation ranges from 800 to 7,050 feet. The average frost-free period ranges from 90 to 205 days. The average annual precipitation ranges from 40 inches near Lake Pillsbury to 70 inches on Hull Mountain.

The principal problems in this resource area are soil erosion and landslides. The hazard of erosion is high because of the steep and very steep slopes and high rainfall. Severe erosion commonly will occur if the plant cover is removed. Landslides and soil slips along the Eel River are a serious problem and a major source of sediment in the river.

Land resource area 14 is in the small valleys near and around Clear Lake. Most of the area is under private ownership. It consists of level or nearly level soils that formed in alluvium on bottom lands and low terraces. The major areas are Scotts Valley, Big Valley, Long Valley, Middle Creek, Bachelor Valley, Lower Lake, Burns Valley, Excelsior Valley, Collayomi Valley, and Coyote Valley. The natural vegetation is mainly annual grasses and a few oaks with riparian vegetation near stream channels. Most of the areas in Scotts Valley, Big Valley, and Middle Creek are presently being farmed. Elevation ranges from 750 to 800 feet. The average frost-free period ranges from 135 to 210 days. The average annual precipitation ranges from 22 inches near Clear Lake to 50 inches near Middletown.

The major land uses within this resource area in Lake County are crop production, livestock grazing, and urban development. Most of the cropland in this area is irrigated. Water used for irrigation is obtained primarily from wells. The main crops are pears, walnuts, and wine grapes.

The principle problems in this resource area are lack of an adequate water supply in some valleys and a short growing season. Other localized problems include flooding; land subsidence and poor soil drainage in Scotts Valley; the presence of a subsoil that is slowly permeable, has high shrink-swell potential, or is calcareous; and some land subsidence in the Big Valley and Lower Lake areas.

Land resource area 15 is on the higher terraces and hills around Clear Lake and includes uplands in the southern two-thirds of Lake County. About one-third of the area is public land that is administered by the Bureau of Land Management and state agencies and two-thirds is privately owned land. The natural vegetation and geology of this resource area is highly complex. Soils that formed in material derived from sandstone, serpentine, and basalt at lower elevations primarily support brush or grass-oak vegetation. Soils that formed in material derived from sandstone and basalt at higher elevations as well as soils on northern aspects primarily support thickets of oak or forests of ponderosa pine, sugar pine, and Douglas-fir. Areas of brush intermingled with the forested areas constitutes the climax vegetation on the shallow soils. Also within this resource area are small valleys. Elevation ranges from 620 feet in the Putah Creek area to 4,300 feet. The average frost-free period ranges from 130 to 205 days. The average annual precipitation ranges from 25 inches in the southeastern corner of Lake County to 60 inches near Mount St. Helena.

The major land uses within this resource area in Lake County are livestock grazing, wildlife habitat, and watershed. There also is some timber production, homesite development, and crop production. Small areas of dryland walnuts and small grain, as well as irrigated walnuts and wine grapes, are mainly on terraces and volcanic hills where deep soils commonly are present.

The principal problems in this resource area are a lack of adequate water supply and severe soil erosion when the vegetation is removed on the steeper slopes. Severe sheet and rill erosion is a problem in the Red Hills area where the natural vegetation has been removed and dryland walnuts are grown.

Storie Index Rating

By Eugene L. Begg, lecturer and soil specialist, University of California, Davis.

The Storie index (*22, 23, 24*) is a numerical rating of soils that expresses their relative degree of suitability for general intensive agricultural use. The rating is based on soil characteristics only and is obtained by evaluating such factors as soil depth, permeability, surface texture, subsoil conditions, drainage, salinity, erosion, fertility, and relief. Other factors, such as availability of water for irrigation, climatic conditions, and distance to markets, all of which might determine the desirability of growing specific crops in a given locality, are not considered in calculating the index. The Storie index rating should not be considered a direct index of land valuation. However, where economic factors are known to the user, the Storie index provides additional objective information for comparison of land values or of comparable parcels of land. The Storie index ratings of each detailed soil map unit in Lake County and the rating of the factors considered are given in table 7.

Four factors that represent the inherent characteristics and qualities of the soils are considered in the index rating. The most favorable or ideal conditions with respect to each factor are rated 100 percent. Decreasing values are assigned to less desirable conditions. The four factors are briefly described in the following paragraphs.

Factor A: Profile characteristics and soil depth. This factor expresses the relative suitability of the soil profile for the growth of plant roots and water movement. Soils that have a deep, permeable profile are rated 100 percent; those that have a restrictive subsurface layer such as a dense claypan or hardpan or are shallow to bedrock are rated lower. The rating depends upon the extent to which water movement and root development are impeded or limited.

Factor B: Texture of the surface layer. This factor rates the texture of the surface layer as an indicator of water holding capacity, ease of tillage, and seedbed

preparation. The moderately coarse and medium textures—fine sandy loam, loam, and silt loam—are considered to be the most ideal and are rated 100 percent. The coarser (sandy) and finer (clayey) textures are rated less than 100 percent.

Factor C: Slope. This factor is an evaluation of ease of irrigation and harvesting, amount of runoff, and susceptibility to erosion. It is particularly important if a soil is irrigated and in harvesting a crop. Smooth, nearly level or very gently sloping soils are rated 100 percent. As the slope gradient increases, the rating for this factor is reduced.

Factor X: Other conditions. Conditions other than the soil profile, surface texture, and slope are considered in factor X. For this survey, the X factors are drainage, flooding, erosion, slumping, general nutrient level, and toxicity. If more than one X factor exists, each is evaluated separately and the values for each are multiplied to obtain the rating for the X factor.

The index rating for a soil is obtained by multiplying the percentage rating assigned to the A, B, C, and X factors. Thus, any one factor or condition may dominate or control the overall rating. For example, consider Tulelake silty clay loam, protected. This soil has a very deep, slowly permeable profile that justifies a rating of 95 percent for factor A; a silty clay loam surface texture that warrants a 90 percent rating for factor B; and a smooth, nearly level surface relief that justifies 100 percent for factor C. A seasonal high water table, however, justifies a rating of 60 percent for factor X. The overall Storie index for this soil is 51 percent. The seasonal high water table limits the selection and rooting depth of crops and justifies the relatively low rating of this soil. If the soil can be drained to lower the water table, then the Storie index can be upgraded by assigning an appropriate higher value to the X factor.

The rating of each map unit is for the dominant soil or soils of the unit. It does not take into account smaller inclusions of other soils or miscellaneous areas. For soil complexes and soil associations, the map units are rated to reflect the proportions of the dominant soils present in the unit.

The soils are placed in grades according to their suitability for general intensive agricultural use as represented by their Storie index ratings. The six grades and their range in index ratings are:

	Index rating
Grade 1	80 to 100
Grade 2	60 to 79
Grade 3	40 to 59
Grade 4	20 to 39
Grade 5	10 to 19
Grade 6	Less than 10

Soils of *Grade 1* have very minor or no limitations that restrict them for general agricultural use. *Grade 2* soils are suitable for most crops, but they have minor limitations that narrow the choice of crops and may require some special management practices. *Grade 3* soils are suited to fewer crops or to specialized crops and require careful management. *Grade 4* soils are limited to a narrow choice of crops; if used for intensive agriculture, they require special management. *Grade 5* soils generally are not suited to cultivated crops, but they can be used for pasture and range. *Grade 6* soils and miscellaneous areas are not suited to agricultural use, but they can be used for timber production, recreation, watershed, and wildlife habitat.

Rangeland

By Walter K. Cheechov, range conservationist, Soil Conservation Service.

About 58 percent of Lake County is considered to be rangeland; of this, about 18 percent is annual grassland or oak-grassland that is suitable for livestock grazing and about 40 percent supports woody, brushlike plants. Beef cattle operations are the major users of the rangeland. Cow-calf operations use the rangeland late in winter and in spring and supplement feeding the rest of the year with hay or irrigated pasture, or both. Stocker operations tend to buy young cattle in December and January, use the rangeland forage during the green-feed period, and sell the heavier cattle in May or June. Sheep operations use some of the rangeland but are on the decline in the survey area.

The rangeland in the survey area predominantly supports annual grasses, clover, and forbs, which commonly are mingled with brush or trees. The annual plants grow from seed each year, germinating after the rains late in fall and early in winter and growing slowly through winter. When the weather warms in spring they grow rapidly and produce seed for the next year's crop. The plants die in May and June after the seed has set and the soil moisture has been depleted. The characteristic and desired plant species are soft chess, wild oat, filaree, ripgut brome, and annual clover.

Perennial grass range is relatively uncommon, mostly being planted on suitable soils by owners to increase green forage periods. Some perennial grasses, such as blue wildrye, grow naturally in very small undisturbed areas and under tree canopies. Perennial grasses do not die each year. These plants survive after the soil moisture has been depleted by "going dormant." During the dormant period, energy is stored in the plant root system. The part of the plant above the surface may be dead but the part at and below the soil surface is alive.

Grass rangeland often supports a significant amount of legumes and forbs mixed with the grasses. Many of these plants have superior value as forage and carry this value further into the grazing season. Legumes and forbs, however, do not provide residual mulch, which helps to protect the soil from erosion, as do grass residue and root systems; therefore, management for a mixed stand of grasses and forbs provides a balance of

quality and quantity of forage plus soil protecting properties.

Forage production is closely tied to the characteristics of the growing season. The growing season varies within the survey area because of the local climate, slope, aspect, and elevation. Annual plant production is related to the amount and distribution of precipitation during the growing season.

Plants that have little or no value as forage for livestock increase on range that is grazed too heavily. Desirable plants are selected first by livestock. These plants are not often allowed to set seed for the next year's crop. Continued heavy grazing reduces the desirable plant seed and thus the next year's plants. At the same time, less desirable plants increase and may dominate the range.

Grasslands under a sustaining grazing management system will retain their productivity. Land not sustained in a good management system will continue to deteriorate to the point where restoration is difficult.

The soils in the brush-covered areas are characteristically shallow and droughty. The vegetation is dominated by large unbroken stands of woody shrubs, brush, or chaparral that commonly are impenetrable by individuals, but some areas consist of small continuous woodlands, mainly along waterways and on north- and east-facing slopes. These lands are used primarily for wildlife habitat, watershed, grazing, and recreation.

Brush-covered areas should be managed to create different successional growth stages in vegetation. Some benefits of managing brush-covered areas include fire protection, wildlife habitat improvement, erosion control, water quality improvement, increased water yield, and increased livestock forage production.

Wildfire is a common natural occurrence in brush-covered areas. Its frequency, however, can be reduced or accelerated by the presence of man. Often, the supression of fire from brush-covered areas for long periods of time results in areas of tall, overgrown brush and an abundance of old dead plant material. When these areas do burn, the fire can be extremely hot; if it is not checked, it can extend into adjacent areas of valuable forest land, rangeland, or urban land. A very hot fire can have a detrimental effect on the physical and chemical properties of the surface soil, and it usually consumes all of the vegetation and litter so that the soil surface is left unprotected from the erosive forces of wind and water. Accelerated erosion can then result in a loss of onsite productivity and a decrease in off-site water quality because of sedimentation. An accelerated frequency of fire over extensive areas can have similar detrimental effects.

Large areas that support overage brush, as compared to younger plants, can be subject to higher rates of erosion, have lower potential for wildlife habitat and forage production, and have less value for recreation. Some brush species produce growth inhibitors that discourage the growth of competing plants. Thus, when brush grows tall, the ground cover below is sparse, which exposes essentially bare soil to the physical impact of water falling from the tall brush. Overage brush generally is out of reach of browsing animals, is difficult to travel through, and has less value for recreation.

Management in brush-covered areas includes prescribed burning, mechanical crushing, constructing firebreaks, developing wildfire watering facilities, and reseeding in selected areas either to reduce erosion during resprouting or to convert to an alternate use. Where the soil has the potential to be used as grassland or woodland, conversion may be desirable; however, most soils under a natural cover of brush do not have the physical properties required for sustained and productive use as grassland or woodland.

Through the implementation of management in brush-covered areas, a mosaic of uneven-aged brush stands can be created. This can reduce the negative effect of wildfire on the county's natural resources, increase the amount and diversity of wildfire, and increase the esthetic, recreational, and forage value.

Brush-covered soils in the county can be divided into four groups. These groups are discussed in the paragraphs that follow. Refer to the section "General Soil Map Units" to find the names of all soils contained within each group.

The most extensive group of brush-covered soils in the survey area is that in general soil map unit 10. Soils in this group commonly are shallow, somewhat excessively drained, and medium textured and formed in material weathered from sandstone. This group of soils occurs throughout the county. Maymen and Etsel soils are dominant. The most common brush species are chamise, manzanita, buckbrush, scrub oak, and Lemmon ceanothus. Grasses such as red brome, foxtail fescue, and bottlebrush squirreltail are common in the understory. Type conversion to grassland has been successful on the Maymen soils in small areas cleared for firebreaks. Careful management is required, however, because the available water capacity of the soils is a limitation.

The second group of brush-covered soils consists of those in general soil map unit 9. The soils in this group commonly are shallow, well drained and somewhat excessively drained, and medium textured and moderately fine textured. They formed in material weathered from serpentinitic rock. This group of soils occurs throughout the county. Henneke, Okiota, and Montara soils are dominant. The common brush species are manzanita, chamise, buckbrush, and scrub oak. Scattered Digger pine and MacNab cypress are also common. The soils are less productive than those that formed in material derived from sandstone or shale because of a calcium to magnesium imbalance induced by the serpentinitic parent material. For this reason the existing vegetation commonly is stunted and scattered,

and type conversion to grassland is not practical. Brush management should only be applied to decadent stands of brush to control wildfire.

A third group of brush-covered soils consists of those in general soil map unit 16 and parts of units 14 and 15. The soils are moderately deep to very deep, well drained, and medium textured and moderately textured, and they formed in material weathered from basic igneous rock. This group of soils occurs at low and intermediate elevations on warm, dry slopes around Mount Konocti and extending southeast toward Lower Lake. Konocti and Benridge soils are dominant. The common brush species are chamise, manzanita, buckbrush, and mountainmahogany. Pitcher sage commonly is present in the understory of dense brush. Small areas of woodland, mainly of knobcone pine, are scattered throughout this group. Some of the soils have physical characteristics that make them suitable for conversion to grassland and, in some places, to cropland and woodland. Careful management is required after conversion. In some areas that have been cleared and cultivated, soil erosion is a problem.

The last group of brush-covered soils consists of those in general soil map unit 7. Soils in this group are very deep, well drained, and moderately fine textured. They formed in material weathered from uplifted sediment of the Cache Formation. This group is in the eastern part of the county, east of Clearlake Highlands. Phipps and Bally soils are dominant. The common brush species are chamise and buckbrush with sparse annual grasses and forbs. Conversion to grassland has been successful, but production is limited during years of low rainfall. Conversion should be limited to the less steeply sloping areas.

In areas that have similar climate and topography, differences in the kind and amount of vegetation produced on rangeland are closely related to the kind of soil. Effective management is based on the relationship between the soils and vegetation and water.

Table 8 shows, for each soil, the range site; the total annual production of vegetation in favorable, normal, and unfavorable years; the characteristic vegetation; and the average percentage of each species. Only those soils that are used as rangeland or are suited to use as rangeland are listed. Explanation of the column headings in table 8 follows.

A *range site* is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from characteristic plant communities on other range sites in kind, amount, and proportion of range plants. The relationship between soils and vegetation was established during this survey; thus, range sites generally can be determined directly from the soil map. Soil properties that affect moisture supply and plant nutrients have the greatest influence on the productivity of range plants. Soil reaction, salt content, and a seasonal water table are also important.

Total production is the amount of vegetation that can be expected to grow annually on well managed rangeland that is supporting the characteristic plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruit of woody plants. It does not include the increase in stem diameter of trees and shrubs. Production is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture.

Dry weight is the total annual yield per acre of air-dry vegetation. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation—the grasses, forbs, and shrubs that make up most of the characteristic plant community on each soil—is listed by common name. Under *composition*, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Range management requires a knowledge of the kinds of soil and of the characteristic plant community. It also requires an evaluation of the present plant species composition.

The objective in range management is to control grazing so that the plants growing on a site produce abundance palatable forage. Such management generally results in the optimal production of vegetation, reduction of undesirable brush species, conservation of water, and control of erosion. Sometimes, however, a range condition somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Woodland Management and Productivity

By Donald L. Berry, forester, Soil Conservation Service.

About 35 percent of Lake County consists of soils that support conifer and hardwood forests; of this, 138,000 acres is considered potentially commercial forest land (*34*). Most of this forest land is in the Mendocino National Forest and Boggs Mountain State Forest.

The forests of the county provide a multitude of benefits. Recreational uses such as camping, hunting, and fishing are common on federally managed land. Much of the privately owned forest land has been

developed for summer resorts and rural homesites, especially in the southern part of the county. Forest land provides important habitat for both fish and wildlife. Forested watershed helps to provide clean water for agricultural, urban, and recreational uses in Lake County and surrounding counties. Wood products such as softwood logs, posts, poles, fuelwood, and Christmas trees are harvested from the county's forests. The Mendocino National Forest and Boggs Mountain State Forest are the main sources of these wood products at the present time; however, substantial forest resources also exist on numerous private ownerships, and most of these are not currently managed for wood production.

Man's activities have played a major role in shaping the present vegetation pattern in Lake County's forests. About two-thirds of the National Forest in the county has burned at least once since 1910. Many areas have burned two or three times. Fires have transferred thousands of acres of potentially productive forest land into brush or knobcone pine cover types. An even greater acreage of marginally productive forest soils is in brush and hardwood types because of past fires.

Timber harvesting was very active during the late 1940's and the 1950's. The Upper Lake District of the Mendocino National Forest had 10 active sawmill and lumber camp sites in 1948. A similar level of activity was probably occurring on private land. There are currently no major lumber mills or wood processing plants in Lake County; however, several adjacent counties have a variety of wood processing facilities (*21*).

Harvesting of timber on non-Federal land must conform to the State Forest Practice Act and to the rules and regulations adopted by the State Board of Forestry. The California Department of Forestry administers and enforces forest practice regulations. This department is also responsible for providing wildfire protection on lands outside of the National Forest, and it maintains fire detection and supression forces in the county.

The major forest cover types in the survey area include Pacific ponderosa pine, Douglas-fir, Sierra Nevada mixed conifer, canyon live oak, California black oak, blue oak-Digger pine, and knobcone pine (*16*). A substantial acreage of knobcone pine is on soils capable of supporting commercially desirable species such as ponderosa pine and Douglas-fir. Cover types of limited extent include Jeffrey pine, Pacific Douglas-fir, Douglas-fir, tanoak, Pacific madrone, black cottonwood, willow, white fir, and red fir.

The following general information, along with the information presented in the section "Detailed Soil Map Units," is intended only as a general guide. It will help professional resource managers, landowners, and visitors to the area understand the characteristics and management of the forest soils in Lake County. Onsite investigation by resource professionals will result in site-specific data and better solutions to resource problems than can be presented in this survey.

Table 9 can be used by woodland owners or forest managers in planning the use of soils for wood crops. Only those soils suitable for wood crops are listed. The table lists the ordination (woodland suitability) symbol for each soil. Soils assigned the same ordination symbol require the same general management and have about the same potential productivity.

The ordination system is a uniform system of labeling individual soils or groups of soils to determine their potential productivity and the main soil properties that influence their use and management as woodland. The ordination system has two levels, class and subclass. The class and subclass symbols are called ordination symbols.

The first element in the ordination is the class. It is a number that denotes potential productivity in cubic meters of wood per hectare per year for an indicator tree species (1 cubic meter per hectare equals 14.3 cubic feet per acre). Potential productivity is based on site index. The growth in cubic meters is calculated at the age of culmination of mean annual increment for fully stocked natural stands (unmanaged except for protection) as given in standard normal yield tables. Potential volume growth values are based on yield tables for Douglas-fir (*29*), for ponderosa pine (*27*), and for white fir (*15*). Yield is the local wood produced in the boles of the trees to the smallest top diameter given in the table.

The second element in the ordination is the subclass. It is a capital letter that denotes certain soil or physiographic characteristics that contribute to important hazards or limitations in management. The subclasses in the survey area are discussed in the following paragraphs.

Subclass A. Soils that have no limitations or only slight limitations for forest land use or management.

Subclass C. Soils that have limitations for forest land use or management because of the kind or amount of clay in the upper part of the soil profile.

Subclass D. Soils that have limitations for forest land use or management because of the restricted rooting depth; for example, shallow soils that are underlain by bedrock, a hardpan, or other layers that restrict roots.

Subclass F. Soils that have limitations for forest land use or management because of a high content of rock fragments in the soil profile. Rock fragments are more than 2 millimeters in diameter and less than 10 inches.

Subclass R. Soils that have limitations for forest land use or management because of steepness of slope.

If a soil has more than one limitation, the priority is as follows: D, C, F, and R. If slight limitations are present, the letter "A" is used. For example, 8A means that potential productivity is 8 cubic meters per hectare per year and that there are slight or no soil related limitations. If moderate or severe limitations are present, the subclasses are designated as D, C, F, or R. For example, 7R means that potential productivity is 7 cubic

meters per hectare per year and that there are moderate or severe limitations because of the steepness of slope. Plant competition and other special considerations are not used to determine subclass.

The *potential productivity* of merchantable or *commonly grown trees* on a soil is expressed as a *site index*. This index is the average height, in feet, that dominant and codominant trees of a given species attain in a specified number of years. The site index applies to fully stocked, even-aged, unmanaged stands. Commonly grown trees are those that woodland managers generally favor in intermediate or improvement cuttings. They are selected on the basis of growth rate, quality, value, and marketability.

The *site index* and the *confidence level (95 percent)* have been listed for each soil in the map unit where adequate data were available. The site indexes for ponderosa pine are based on the 100-year base age curves (*27*). Site indexes for Douglas-fir are from 100-year base age curves (*29*). Procedures for converting to the 50-year base age curves (*11*) for Douglas-fir have been described by Krumland and Wensel (*12*). White fir site indexes are from the 50-year base age curves by Schumacher (*15*). The confidence limit indicates the reliability of the site index estimate.

Estimates of the potential production for each soil, in board feet per acre per year at the culmination of the mean annual increment (CMAI), are given in the detailed map unit descriptions. Volumes are given for ponderosa pine (*27*), for white fir (*15*), and for Douglas-fir (*29*); fully-stocked, unmanaged stands were assumed. Wind can reduce productivity well below estimates for the soil on exposed ridges. Open areas, such as those caused by the presence of rock outcroppings at high elevations, also reduce productivity of map units.

The potential production of soils that commonly produce hardwoods is difficult to estimate. Site indexes for soils that support California black oak are from the curves by Powers (*30*). Hardwood yield estimates are based on local plot measurements and on volume tables by Pillsbury and Stephens (*17*).

In table 9, *slight*, *moderate*, and *severe* indicate the degree of the major soil limitations to be considered in management.

Ratings of *equipment limitations* reflect the characteristics and conditions of the soil that restrict use of the equipment generally needed in woodland management or harvesting. A rating of *slight* indicates that use of equipment or time of year; *moderate* indicates a short seasonal limitation or a need for some modification in management or in equipment; and *severe* indicates a seasonal limitation, a need for special equipment or management, or a hazard in the use of equipment.

Soil wetness has an influence on the type of equipment that is used and on time of use. Soils usually are too wet for ground yarding systems between November 15 and April 1. Soil compaction by wheeled or tracked equipment can be a problem on all soils when they are moist except sandy or very gravelly soils. The State Forest Practice Act prohibits timber harvesting, except by cable yarding, when the ground is excessively wet. Roads frequently are impassable during the rainy season, except where they have been rocked or where they are in areas of very gravelly or sandy soils. Depth of snowpack limits access and equipment use at elevations of more than 4,500 feet from December 15 through April 15. Some soils, such as those of the Kekawaka, Forward, and Sheetiron series, are dusty when dry. Watering, oiling, or other road surface and dust control treatments may be desirable on these soils during periods of heavy use.

Steepness of slope is an important consideration when selecting harvesting equipment or systems. Slope gradients of less than 30 percent present few limitations to wheeled and tracked equipment. Where slopes are 30 to 50 percent, more care is needed in choosing equipment suited to the site. Cable yarding systems generally cause the least soil disturbance where the terrain and road systems are conducive to their use; however, where existing skid and haul roads can be used or where short, steep slopes are intermingled with level areas, tractor yarding equipment can sometimes be used with minimal soil disturbance. Low ground-pressure, torsion-suspension equipment can be used on steeper slopes with less soil disturbance and compaction than if conventional tractor equipment is used (*7, 20*). Large areas in which slope is more than 50 percent generally are subject to less soil disturbance when cable yarded than when tractor yarded.

Seedling mortality ratings indicate the degree to which the soil affects the mortality of tree seedlings. Plant competition, which may be a significant factor, is not considered in the ratings. The ratings apply to seedlings from good stock that are properly planted during a period of sufficient rainfall. A rating of *slight* indicates that no problem is expected under normal conditions; *moderate*, that extra precautions are advisable; and*severe*, that precautions are important and that replanting may be necessary. Trees to plant are those that are suited to the soils and to commercial wood production. Adapted species are named in the detailed map unit descriptions. Natural reseeding by conifers is sometimes adequate. Where mineral soil material is exposed during years of favorable seed production, good regeneration can be expected on all but very gravelly, shallow, or serpentinitic soils. Most of the hardwood species resprout after cutting. Resprouting is best when cutting is done during December through May (*31*).

Soil properties that commonly influence seedling mortality include texture, content of rock fragments, temperature, and drainage. Soils that have available water capacity of less than 2.5 inches in the upper 24 inches of soil are severely limited for seedlings,

especially on south-facing slopes below an elevation of 5,000 feet. Low available water capacity is less critical at the higher elevations, where the soils are cooler. Soils at low elevation that have relatively warm mean annual temperatures can present major problems for survival of seedlings. Soil temperature at a depth of 20 inches commonly is 20 degrees F higher in the open than under a tree canopy. Surface temperature may also be high enough in summer to cause heat injury to Douglas-fir seedlings on south-facing slopes. Frost heaving of newly planted seedlings, especially containerized stock, can increase seedling mortality. The danger of frost heave is greatest on nonskeletal soils that are high in content of silt or ash. Species selection, type of planting stock, availability of shade, type of harvest, and available water capacity of the soil need to be considered when reforesting soils in this area.

Ratings of *plant competition* indicate the degree to which undesirable plants are expected to invade where there are openings in the tree canopy. The invading plants compete with native plants or planted seedlings. A rating of *slight* indicates little or no competition from other plants; *moderate*, that plant competition is expected to hinder the development of a fully stocked stand of desirable trees; and *severe*, that plant competition is expected to prevent the establishment of a desirable stand unless the site is intensively prepared, weeded, or otherwise managed to control undesirable plants. The species of competing plants and severity of competition vary depending on the kind of soil and past treatment of the site.

Plant competition is related to the available water capacity of the soils. Productive soils have high available water capacity, and plant competition on these soils generally is severe. Black oak, madrone, varieties of manzanita, perennial and annual grasses, and forbs can dominate a site for several years after timber is harvested. Conifer seedlings often are slow to regenerate and overtop the other vegetation because of the competition for moisture and light. Careful selection of the silvicultural and harvesting systems or intensive site preparation may be needed to ensure adequate reforestation. Less productive soils have lower available water capacity, and plant competition on them is less intense, except where unwanted plants have had enough time to establish extensive root systems; however, tree growth on these soils is slower and the seedling mortality rate may be high because of the high temperatures and lack of adequate soil moisture.

Ratings of the *hazard of damage from fire* are intended to be used as a general guideline when planning either prescribed burning or revegetation after wildfire. Soil damage can sometimes result from burning. The risk of damage increases with the intensity of heat. The damage is mainly related to the loss of organic matter (*35*). Some soils have characteristics that enable them to withstand this loss better than other soils. These characteristics are used to rate the soils for their hazard of damage from fire. A rating of *slight* indicates that most types of fire will not have an adverse effect on soil characteristics and future productivity; *moderate*, that some extra care is needed in planning to maintain favorable soil characteristics; and *severe*, that special attention is needed to maintain the organic matter content of the soil in order to maintain productivity.

Ratings of the *hazard of damage from compaction* indicate the tendency of a soil to be adversely affected by the weight of equipment or other traffic. Soil density is increased after compaction. This can affect productivity by increasing resistance to root penetration and reducing the availability of oxygen to plant roots. It may also reduce permeability and the water infiltration rate. Ratings are based on the texture, organic matter content, and rock fragment content of the upper 10 inches of the soil. A rating of *slight* indicates that considerable effort would be required to compact the soil enough to adversely affect plant growth or the water infiltration rate; *moderate*, that less effort is required to cause compaction or that an easily compacted soil also recovers rapidly because of the type and amount of clay; and *severe*, that the soils are compacted easily enough to cause adverse effects and that they do not readily recover. Compaction is most likely to occur when the soil is moist. Forest management activities that can cause compaction are site preparation, log skidding, livestock grazing, or any other activity that applies weight on a moist soil (*8, 33*).

Ratings of the *hazard of sheet and rill erosion when yarded by tractor or skyline* are given in table 9. The rating is *slight* if the expected soil loss is small, *moderate* if measures are needed to control erosion during logging and road construction, and *severe* if intensive management or special equipment and methods are needed to prevent excessive loss of soil. The ratings are based on approximately 180 transects, which were done in recently harvested areas in Northern California to determine common conditions. Remaining overstory and understory vegetation, slash, root systems, and waterbars reduced the erosion hazard below that for bare soil. The hazard of sheet and rill erosion following timber harvesting generally was found to be slight (occasionally moderate) for the harvested areas as a whole where cable yarding was used. Tractor yarding generally resulted in higher erosion on steep slopes. This is in agreement with most research literature on the subject (*36*).

A rating for the hazard of erosion under bare soil conditions is also given in the map unit descriptions. This rating is included as a basis for comparison with all other soils nationwide. The rating is valid only for a soil devoid of vegetation, mulch, or other ground cover. This condition would be expected to occur rarely. An extremely hot fire, tillage for agriculture, or attempted conversions to other land uses could result in bare soil

conditions. The rating provides a general guide to the erodibility of exposed soil on skid trails and landings. This rating is based on the slope of the land and the inherent erodibility of the soil. See "Erosion hazard" in the glossary for interpretation of the ratings given in the detailed map unit descriptions.

The rating accounts neither for gully, ditch, or streambank erosion nor for mass movement caused by geologic conditions, unusual local moisture conditions, ground disturbance, or plant manipulation. Soils that have an obvious tendency to slump or gully or that are known to be susceptible to mass movement are identified in the map unit descriptions. Existing slips are shown on the soil maps if they were recognized by the soil scientists. The use of slope stability maps and onsite investigation of these hazards is strongly encouraged.

When used together, the ratings of erosion hazard and susceptibility to compaction can help the user decide if a significant reduction in the future growth rate is likely to occur.

Practices that can be used to prevent excessive soil loss and degradation of water quality vary from one area to another. Proper location, design, and installation of roads, culverts, waterbars, and stream crossings are critical. Seeding or mulching of cut and fill slopes, where soil conditions make it needed and feasible, reduces sheet and rill erosion. Buffer strips along streams help to prevent sediment from entering the water, control streambank erosion, and may help to maintain favorable water temperature.

Erosion control and soil characteristics need to be considered when planning site preparation for tree planting. Machinery, chemicals, and fire can all have an adverse effect on the soil characteristics and rate of erosion if they are not properly used or applied. Selection of the proper equipment and a careful, skilled operator are the keys to controlling erosion related to forest management activities.

Woodland Understory Vegetation

Understory vegetation consists of grasses, forbs, shrubs, and other plants. Some woodland, if well managed, can produce enough understory vegetation to support grazing of livestock or wildlife, or both, without damage to the trees.

The quantity and quality of understory vegetation vary with the kind of soil, the age and kind of trees in the canopy, the density of the canopy, and the depth and condition of the litter. The density of the canopy determines the amount of light that understory plants receive. Much of the oak woodland in Lake County is grazed by livestock and wildlife. The understory generally consists of plant communities similar to those of the annual rangeland in the county. Forage production estimates are given in table 8. Emphasis needs to be placed on livestock distribution practices, such as fencing, developing livestock watering facilities, and properly locating salt and minerals in order to achieve proper use of the forage. Stocking rates should be based on the usable forage, which generally decreases as the canopy becomes more dense.

If wood production is also an objective in grazed areas, provisions should be made to secure regeneration of the trees. On soils that are susceptible to compaction, grazing season or stocking rates may need to be modified to avoid major reductions in the tree growth rate.

Where wood production is not an objective of the landowner, trees are sometimes thinned or removed in an effort to increase the usable forage for livestock. In addition, seeding with desirable forage plants is sometimes done in the more nearly level areas. Many of these soils are well suited to growing woody species but may require follow-up treatment to eliminate brush or trees. The value of woody species for wildlife habitat should be considered.

Vegetation along stream channels provides important fish and wildlife habitat. Retention of streamside vegetation helps to prevent streambank erosion and gully formation and to prevent sediment from surrounding areas from reaching the streams.

In areas of steep slopes, some soils have a tendency to slip when all the trees are removed. Landslips frequently do not occur during the first year after clearing, but the susceptibility of the soils may increase after a few years under grass cover. The soils on which this is likely to occur are identified in the detailed map unit descriptions.

Commercial conifer forest land generally is not grazed by livestock, but it does provide valuable wildlife habitat until the canopy becomes very dense. The understory under a full canopy commonly consists of sparse annual forbs, scattered perennial grasses, and shrubs. Total usable forage production under a full canopy commonly is less than 250 pounds per acre. Usable forage production increases for a few years after the canopy cover is removed by timber harvest or fire, but it declines rapidly as new trees begin to develop a canopy cover. These temporary openings are sometimes managed for livestock or wildlife use. Some of the large burned areas in the National Forest have been leased for grazing.

A few forest soils in the survey area have chemical toxicity or imbalances that hinder tree growth. Soils that formed in material derived from serpentinitic parent material are known to have a calcium to magnesium ratio that is detrimental to Douglas-fir and ponderosa pine. On soils such as the Dubakella and Okiota soils, Sargent cypress, MacNab cypress, incense-cedar, Digger pine, Jeffrey pine, and various shrub species frequently are dominant. Large acreages of these soils are in the southern and eastern parts of the county.

Insect and disease problems occur readily when trees are under stress. Tree stress can result where chemical

imbalances exist in the soils or when the supply of moisture is either inadequate or excessive. Drought-induced disease and insect problems are most likely to occur on the Arrowhead, Bottlerock, Deadwood, Decy, Kidd, Marpa, Neuns, Sheetiron, Speaker, Speaker Variant, Whispering, and Yollabolly soils.

Some of the soils in the Red Hills area that currently support brush and walnut orchards appear to be suited to timber production. Data obtained from the few existing stands of ponderosa pine in the area suggest that the soils are capable of producing trees at rates of 400 to 500 board feet per acre per year (Meyer's site classes I and II). Christmas tree production is feasible in the more nearly level areas in which irrigation water is available. Plans to convert to forest plantations should include plans for firebreaks if the soils are adjacent to brushland that is subject to a high hazard of fire.

Recreation

Recreation is an important part of the esthetic appeal and economy of Lake County. Both public and private lands provide areas that have good potential for recreational opportunities for the local population and to the some 200,000 tourists that visit the county annually. Recreational opportunities and demand for them will be even greater as the population increases and facilities are improved or developed.

The mountains and lakes in the county are attractions that have made recreation a major source of income throughout its history. Four major lakes—Clear Lake, Lake Pillsbury, Blue Lakes, and Indian Valley Reservoir—provide opportunities for fishing, boating, and water sports. The hills and mountains in the county have good potential for hunting, fishing, hiking, horseback riding, and camping.

About 50 percent of the land in the county is administered by Federal, State, and local governmental agencies. Campgrounds, hiking trails, and off-road vehicle trails are maintained in the Mendocino National Forest and the Boggs Mountain State Forest. The county also has several state, county, and city parks, including Clear Lake State Park.

The development of private recreational facilities includes campgrounds, summer resort concessions, golf courses, and guest ranches.

The soils of the survey area are rated in table 10 according to limitations that affect their suitability for recreation. The ratings are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewerlines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation are also important. Soils subject to flooding are limited for recreational use by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

In table 10, the degree of soil limitation is expressed as slight, moderate, or severe. *Slight* means that soil properties generally are favorable and that limitations are minor and easily overcome. *Moderate* means that limitations can be overcome or alleviated by planning, design, or special maintenance. *Severe* means that soil properties are unfavorable and that limitations can be offset only by costly soil reclamation, special design, intensive maintenance, or limited use, or by a combination of these measures.

The information in table 10 can be supplemented by other information in this survey; for example, interpretations for dwellings without basements and for local roads and streets in table 11 and interpretations for septic tank absorption fields in table 12.

Camp areas require site preparation such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The best soils are gently sloping and are not wet or subject to flooding during the period of use. The surface has few or no stones or boulders, absorbs rainfall readily but remains firm, and is not dusty when dry. Strong slopes and stones or boulders can greatly increase the cost of constructing campsites.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The best soils for picnic areas are firm when wet, are not dusty when dry, are not subject to flooding during the period of use, and do not have slopes or stones or boulders that increase the cost of shaping sites or of building access roads and parking areas.

Playgrounds require soils that can withstand intensive foot traffic. The best soils are almost level and are not wet or subject to flooding during the season of use. The surface is free of stones and boulders, is firm after rains, and is not dusty when dry. If grading is needed, the depth of the soil over bedrock or a hardpan should be considered.

Paths and trails for hiking and horseback riding should require little or no cutting and filling. The best soils are not wet, are firm after rains, are not dusty when dry, and are not subject to flooding more than once a year during the period of use. They have moderate slopes and few or no stones or boulders on the surface.

Golf fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. The best soils for use as golf fairways are firm when wet, are not dusty when dry, and are not subject to prolonged flooding during the period of use. They have

moderate slopes and no stones or boulders on the surface. The suitability of the soil for tees or greens is not considered in rating the soils.

Wildlife Habitat

By David W. Patterson, biologist, Soil Conservation Service.

Wildlife and fish provide opportunities for recreation and income and add to the enjoyment and quality of life in Lake County. Rangeland and wooded areas interspersed with or adjacent to both irrigated and nonirrigated areas provide many habitats suited to a variety of game and nongame wildlife species. Isolated ponds and small wetlands, as well as Anderson Marsh, located at the south end of Clear Lake, provide valuable wetland habitat for waterfowl, shore birds, heron, and egrets and drinking water for other wildlife. Many of the watersheds in the county are dominated by large, unbroken stands of mature chamise and manzanita and scrub oak brush fields. The proper application of brush management that includes prescribed burning can increase the amount of habitat available for deer and other wildlife, increase the amount of food and access for livestock, and improve access for hunting. Large areas of annual grasses mixed and interspersed with brush and trees provide habitat for black-tailed deer, which are present primarily as resident herds. Some may be pushed out of the higher mountains by infrequent winter snowstorms. Better distribution of drinking water on rangeland and increased use of fire to create a mosaic of uneven-aged brush stands on brushland can increase the amount and diversity of wildlife.

The soil survey area is well dissected by perennial streams at upper elevations and by intermittent creeks at lower elevations. Both perennial and intermittent stream corridors support esthetically pleasing stands of streamside vegetation, which provide important habitat for both fish and wildlife. Wildlife species of particular interest include American bald eagle, golden eagle, peregrine falcon, blue and ruffed grouse, migratory band-tailed pigeon, introduced wild turkey, and feral hogs. Two small herds of tule elk have been reintroduced into the county.

Cold-water fish, including rainbow trout, anadromous steelhead trout, and king salmon, spend part or all of their life in the Eel River and parts of Bucknell, Dashiell, Benmore, and Soda Creeks in the Mendocino National Forest. Nongame fish species of special interest include the Sacramento blackfish, Sacramento perch, tule perch, and introduced Mississippi silverside, all of which occur in Clear Lake. Besides trout, warm-water fish such as smallmouth and largemouth black bass, crappie, catfish, bullheads, sunfish, and minnows occupy sloughs, ponds, and lakes. The potential impact of accelerated watershed erosion and excessive nutrients on fish habitat and water quality are a major concern for land use planners and fishery managers.

The kinds and abundance of wildlife species that populate an area depend largely on the amount and distribution of food, cover, and water. If any of these elements are missing, inadequate, or inaccessible, wildlife will either be scarce or absent. Soil characteristics alone rarely dictate the presence or absence of particular wildlife species; however, along with other factors such as climate, soils directly affect the amount and distribution of vegetation that is available to wildlife as food and cover, and often the availability of water as well. If soils have the potential, wildlife habitat can be created or improved in most areas. Wildlife is a crop or product of the land. For this reason, information on soils should be considered when planning for wildlife either as a primary or secondary land use.

To facilitate the discussion of the relationship between wildlife and soils, the soils in the survey area have been placed in groups consisting of general soil map units. These groups are made up of soils that have similar characteristics and produce or have the potential to produce the same general type of habitat. Although soil characteristics alone rarely dictate the presence or absence of a particular wildlife species, the plant component of habitat expressed through existing or potential plant cover is strongly influenced by soil characteristics. The discussion of each group includes common soil characteristics, representative vegetation, wildlife habitat types, and important management considerations. The groups are discussed in the following paragraphs. To determine names of all the soils in each group, refer to the section "General Soil Map Units."

Group I.—This group consists of general soil map units 1 and 2. It makes up about 2 percent of the survey area. The soils in this group are in basins and marshes. They typically are very deep, nearly level, poorly drained and very poorly drained, and fine textured.

The vegetation in this group varies with the degree of wetness of the soils. The wetter soils support wetland vegetation such as marsh grasses, tule, and other water-tolerant plants. Higher lying areas or previously wet areas that have been drained support grapes, orchards, and field crops. Interspersed are the small scattered areas of annual grasses, forbs, and occasional oaks. Streamside vegetation associated with waterways is also included in this group. Important wildlife management considerations on this group include (1) retaining wetlands, (2) retaining streamside vegetation, (3) using diverse crops and cropping patterns, (4) maintaining or establishing odd areas of herbaceous plants, (5) maintaining or establishing blocks or rows of shrubs or trees, and (6) providing dependable drinking water.

Group II.—This group consists of general soil map units 3, 4, 5, and 6. It makes up about 6 percent of the survey area. The soils in this group are on alluvial plains, alluvial terraces, flood plains, basin floors, and valley

rims. They typically are very deep, nearly level to strongly sloping, somewhat excessively drained to somewhat poorly drained, and medium textured to fine textured. The vegetation consists of grasses with scattered oaks or is crops or pasture. In some areas of this group are Riverwash and sandbars associated with waterways.

Important wildlife considerations include (1) retention of streamside vegetation; (2) retention of trees and shrubs in farmed areas; (3) proper grazing use by livestock; (4) retention of native oaks, both living and dead; and (5) the provision of a dependable supply of drinking water.

Group III.—This group consists of general soil map units 7, 8, and 15. It makes up about 21 percent of the survey area. The soils are on hills. They are shallow to very deep, gently sloping to very steep, well drained, and medium textured and moderately fine textured.

The vegetation in this group is mainly open areas of annual grasses with stands of brush and trees, mainly oaks, interspersed throughout. This group is transected by intermittent streams.

Important wildlife management considerations include (1) proper grazing use by livestock; (2) provision of a dependable supply of drinking water; (3) retention of native oaks, both living and dead; and (4) management of large brush fields.

Group IV.—This group consists of general soil map units 9, 10, 14, and 16. It makes up about 41 percent of the survey area. The soils in this group are on hills and mountains. They are shallow to very deep, gently sloping to very steep, well drained to somewhat excessively drained, and moderately coarse textured to moderately fine textured.

The vegetation in this group is predominantly brush. Oaks grow as scattered individual trees or as continuous woodland, especially on north-facing slopes. Other trees, including Digger pine and knobcone pine, also grow as scattered individual trees or in stands. Vast brush fields that commonly are impenetrable by man, livestock, or wildlife are typical in this group. Waterways and north-facing slopes associated with this group commonly support a greater diversity of both trees and shrubs. Areas dominated by soils that formed in material derived from serpentine produce very little vegetation and have little potential for improvement.

This group provides large areas of rangeland habitat. There are relatively small amounts of important woodland habitat on north-facing slopes and along waterways. These small stands of woodland habitat generally offer the only diversity in habitat within vast brush fields. Areas of Rock outcrop that are associated with some of the soils provide important habitat for some wildlife species, especially some birds of prey, rodents, and reptiles.

Important wildlife management considerations include (1) brush management, including management of closely growing trees; (2) provision of a dependable supply of drinking water; and (3) retention of native oaks, both living and dead.

Group V.—This group consists of general soil map units 11, 12, 13, and 17. It makes up about 29 percent of the survey area. The soils in this group are primarily on mountainsides and mountaintops. They are shallow to very deep, moderately sloping to very steep, well drained to excessively drained, and moderately coarse textured and medium textured.

The vegetation on this group is primarily coniferous trees with varied understory communities consisting of brush and scattered clumps and strips of brush and broadleaf trees. Areas of this group are dissected by both perennial and intermittent waterways and associated trees and shrubs.

This group provides large areas of woodland habitat that is made fairly diverse by the presence of rock outcroppings, waterways, and trees of varying age because of timber harvesting and silvicultural practices. This group also provides rangeland and wetland habitat.

Important wildlife management considerations include (1) retention of broadleaf trees and shrubs within commercial timber plantations to increase the diversity of the wildlife habitat; (2) retention of uneven-aged trees both within and between commercial timber plantations; (3) close compliance with proper timber harvesting practices to protect woodland soil and plant resources; (4) proper design, maintenance, and closing of timber access roads to protect instream water quality; and (5) retention of significant snags and den trees for nesting birds and denning mammals.

The foregoing discussion of habitat groups provides a guide to the habitat types and elements best suited to the soils in each group; however, the major soils in each group have varying characteristics that determine the potential and feasibility of managing or improving habitat on them. Land planners and managers should consider the characteristics of the soils in consultation with biologists, agronomists, range conservationists, foresters, and engineers when planning the management or development of wildlife habitat. Water retention structures such as ponds commonly are needed when improving wildlife habitat. Interpretations for both embankments and reservoirs areas are provided for each soil in table 14.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. The ratings are given in the following tables: Building Site Development, Sanitary Facilities, Construction Materials, and Water Management. The ratings are based on observed

performance of the soils and on the estimated data and test data in the "Soil Properties" section.

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil within a depth of 5 or 6 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations need to be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about grain-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 6 feet of the surface, soil wetness, depth to a seasonal high water table, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kind of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential (fig. 5), available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to (1) evaluate the potential of areas for residential, commercial, industrial, and recreation uses; (2) make preliminary estimates of construction conditions; (3) evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; (4) evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; (5) plan detailed onsite investigations of soils and geology; (6) locate potential sources of gravel, sand, earthfill, and topsoil; (7) plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and (8) predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps and soil descriptions, and other data provided in this survey can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Table 11 shows the degree and kind of soil limitations that affect shallow excavations, dwellings with and without basements, small commercial buildings, local roads and streets, and lawns and landscaping. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required. Special feasibility studies may be required where the soil limitations are severe.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for basements, graves, utility lines, open ditches, and other purposes. The ratings are based on soil properties, site features, and observed performance of the soils. The ease of digging, filling, and compacting is affected by the depth to bedrock, a cemented pan, or a very firm dense layer; rock fragments; soil texture; and slope. The time of the year that excavations can be made is affected by the depth to a seasonal high water table and the susceptibility of the soil to flooding. The resistance of the excavation walls or banks to sloughing or caving is affected by soil texture and the depth to the water table.

Dwellings and small commercial buildings are structures built on shallow foundations on undisturbed soil. The load limit is the same as that for single-family dwellings no higher than three stories. Ratings are made for small commercial buildings without basements, for dwellings with basements, and for dwellings without basements. The ratings are based on soil properties, site features, and observed performance of the soils. A high water table, flooding, shrink-swell potential, and organic layers can cause the movement of footings. A high water table, depth to bedrock or to a cemented pan, large stones, and flooding affect the ease of excavation and construction. Landscaping and grading that require cuts and fills of more than 5 to 6 feet are not considered.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material, a base of gravel, crushed rock, or stabilized soil material, and a flexible or rigid surface. Cuts and fills generally are limited to less than 6 feet. The ratings are based on soil properties, site features, and observed performance of the soils. Depth to bedrock or to a cemented pan, a high water table, flooding, large stones, and slope affect the ease of excavating and grading. Soil strength (as inferred from the engineering classification of the soil),

Figure 5.—Effects of shrinking and swelling in an area of Clear Lake clay. The soil shrinks and cracks when dry and swells when wet, which limits homesite and urban development.

shrink-swell potential, and depth to a high water table affect the traffic supporting capacity.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. The ratings are based on soil properties, site features, and observed performance of the soils. Soil reaction, a high water table, depth to bedrock or to a cemented pan, and the available water capacity in the upper 40 inches affect plant growth. Flooding, wetness, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer affect trafficability after vegetation is established.

Sanitary Facilities

Table 12 shows the degree and the kind of soil limitations that affect septic tank absorption fields, sewage lagoons, and sanitary landfills. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increases in construction costs, and possibly increased maintenance are required.

Table 12 also shows the suitability of the soils for use as daily cover for landfills. A rating of *good* indicates that soil properties and site features are favorable for the use and good performance and low maintenance can be expected; *fair* indicates that soil properties and site

features are moderately favorable for the use and one or more soil properties or site features make the soil less desirable than the soils rated good; and *poor* indicates that one or more soil properties or site features are unfavorable for the use and overcoming the unfavorable properties requires special design, extra maintenance, or costly alteration.

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 72 inches is evaluated. The ratings are based on soil properties, site features, and observed performance of the soils. Permeability, a high water table, depth to bedrock or to a cemented pan, and flooding affect absorption of the effluent. Large stones and bedrock or a cemented pan interfere with installation.

Unsatisfactory performance of septic tank absorption fields, including excessively slow absorption of effluent, surfacing of effluent, and hillside seepage, can affect public health. Ground water can be polluted if highly permeable sand and gravel or fractured bedrock is less than 4 feet below the base of the absorption field, if slope is excessive, or if the water table is near the surface. There must be unsaturated soil material beneath the absorption field to filter the effluent effectively. Many local ordinances require that this material be of a certain thickness.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Lagoons generally are designed to hold the sewage within a depth of 2 to 5 feet. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of ground water.

Table 12 gives ratings for the natural soil that makes up the lagoon floor. The surface layer and, generally, 1 or 2 feet of soil material below the surface layer are excavated to provide material for the embankments. The ratings are based on soil properties, site features, and observed performance of the soils. Considered in the ratings are slope, permeability, a high water table, depth to bedrock or to a cemented pan, flooding, large stones, and content of organic matter.

Excessive seepage because of rapid permeability of the soil or a water table that is high enough to raise the level of sewage in the lagoon causes a lagoon to function unsatisfactorily. Pollution results if seepage is excessive or if floodwater overtops the lagoon. A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor.

Sanitary landfills are areas where solid waste is disposed of by burying it in soil. There are two types of landfill—trench and area. In a trench landfill, the waste is placed in a trench. It is spread, compacted, and covered daily with a thin layer of soil excavated at the site. In an area landfill, the waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site.

Both types of landfill must be able to bear heavy vehicular traffic. Both types involve a risk of ground water pollution. Ease of excavation and revegetation needs to be considered.

The ratings in table 12 are based on soil properties, site features, and observed performance of the soils. Permeability, depth to bedrock or to a cemented pan, a high water table, slope, and flooding affect both types of landfill. Texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium affect trench type landfills. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, a limitation rated slight or moderate may not be valid. Onsite investigation is needed.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area type sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste.

Soil texture, wetness, coarse fragments, and slope affect the ease of removing and spreading the material during wet and dry periods. Loamy or silty soils that are free of large stones or excess gravel are the best cover for a landfill. Clayey soils are sticky or cloddy and are difficult to spread; sandy soils are subject to wind erosion.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as final cover for a landfill should be suitable for plants. The surface layer generally has the best workability, more organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

Construction Materials

Table 13 gives information about the soils as a source of roadfill, sand, gravel, and topsoil. The soils are rated *good, fair,* or *poor* as a source of roadfill and topsoil. They are rated as a probable or improbable source of sand and gravel. The ratings are based on soil properties and site features that affect the removal of the soil and its use as construction material. Normal compaction, minor processing, and other standard construction practices are assumed. Each soil is evaluated to a depth of 5 or 6 feet.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the soil material below the surface layer to a depth of 5 or 6 feet. It is assumed that soil layers will be mixed during excavating and spreading. Many soils have layers of contrasting suitability within their profile. The table showing engineering index properties provides detailed information about each soil layer. This information can help determine the suitability of each layer for use as roadfill. The performance of soil after it is stabilized with lime or cement is not considered in the ratings.

The ratings are based on soil properties, site features, and observed performance of the soils. The thickness of suitable material is a major consideration. The ease of excavation is affected by large stones, a high water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the engineering classification of the soil) and shrink-swell potential.

Soils rated *good* contain significant amounts of sand or gravel, or both. They have at least 5 feet of suitable material, low shrink-swell potential, few cobbles and stones, and slopes of 15 percent or less. Depth to the water table is more than 3 feet. Soils rated *fair* are more than 35 percent silt- and clay-sized particles and have a plasticity index of less than 10. They have moderate shrink-swell potential, slopes of 15 to 25 percent, or many stones. Depth to the water table is 1 to 3 feet. Soils rated *poor* have a plasticity index of more than 10, a high shrink-swell potential, many stones, or slopes of more than 25 percent. They are wet, and the depth to the water table is less than 1 foot. They may have layers of suitable material, but the material is less than 3 feet thick.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. Sand and gravel are used in many kinds of construction. Specifications for each use vary widely. In table 13, only the probability of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material.

The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the engineering classification of the soil), the thickness of suitable material, and the content of rock fragments. Kinds of rock, acidity, and stratification are given in the taxonomic unit descriptions. Gradation of grain sizes is given in the table on engineering index properties.

A soil rated as a *probable* source has a layer of clean sand or gravel or a layer of sand or gravel that is as much as 12 percent silty fines. This material must be at least 3 feet thick and less than 50 percent, by weight, large stones. All other soils are rated as an *improbable* source. Coarse fragments of soft bedrock, such as shale and siltstone, are not considered to be sand and gravel.

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area.

Plant growth is affected by toxic material and by such properties as soil reaction, available water capacity, and fertility. The ease of excavating, loading, and spreading is affected by rock fragments, slope, a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, a water table, rock fragments, bedrock, and toxic material.

Soils rated *good* have friable loamy material to a depth of at least 40 inches. They are free of stones and cobbles, have little or no gravel, and have slopes of less than 8 percent. They are low in content of soluble salts, are naturally fertile or respond well to fertilizer, and are not so wet that excavation is difficult.

Soils rated *fair* are sandy soils, loamy soils that have a relatively high content of clay, soils that have only 20 to 40 inches of suitable material, soils that have an appreciable amount of gravel, stones, or soluble salts, or soils that have slopes of 8 to 15 percent. The soils are not so wet that excavation is difficult.

Soils rated *poor* are very sandy or clayey, have less than 20 inches of suitable material, have a large amount of gravel, stones, or soluble salts, have slopes of more than 15 percent, or have a seasonal water table at or near the surface.

The surface layer of most soils generally is preferred for topsoil because of its organic matter content. Organic matter greatly increases the absorption and retention of moisture and nutrients for plant growth.

Water Management

Table 14 gives information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas and embankments, dikes, and levees. The limitations are considered *slight* if soil properties and site features generally are favorable for the indicated use and limitations are minor and are easily overcome; *moderate* if soil properties or site features are not favorable for the indicated use and special planning, design, or maintenance is needed to overcome or minimize the limitations; and *severe* if soil properties or site features are so unfavorable or so difficult to overcome that special design, significant increase in construction costs, and possibly increased maintenance are required.

This table also gives for each soil the restrictive features that affect drainage, irrigation, terraces and diversions, and grassed waterways.

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even more than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Drainage is the removal of excess surface and subsurface water from the soil. How easily and effectively the soil is drained depends on the depth to bedrock, to a cemented pan, or to other layers that affect the rate of water movement; permeability; depth to a high water table or depth of standing water if the soil is subject to ponding; slope; susceptibility to flooding; subsidence of organic layers; and potential frost action. Excavating and grading and the stability of ditchbanks are affected by depth to bedrock or to a cemented pan, large stones, slope, and the hazard of cutbanks caving. The productivity of the soil after drainage is adversely affected by extreme acidity or by toxic substances in the root zone, such as salts, sodium, or sulfur. Availability of drainage outlets is not considered in the ratings.

Irrigation is the controlled application of water to supplement rainfall and support plant growth. The design and management of an irrigation system are affected by depth to the water table, the need for drainage, flooding, available water capacity, intake rate, permeability, erosion hazard, and slope. The construction of a system is affected by large stones and depth to bedrock or to a cemented pan. The performance of a system is affected by the depth of the root zone, the amount of salts or sodium, and soil reaction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to reduce erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock or to a cemented pan affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock or to a cemented pan affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic substances such as salts or sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Slope Stability

This section discusses mass movement of earth material as it relates to the soils in the survey area. Mass movement is a process of downslope movement of earth material, including natural rock, soil, construction fill, or combinations of these materials (*14*). It is not within the scope of this soil survey to define all the types of mass erosion processes that occur within the county, nor to recognize the past, present, or potential for future occurrence of such events. Properties of soil alone rarely control the occurrence of mass erosion processes. Many slope failures are a function of geologic, hydrologic, and vegetative factors in combination with or independent of the kind of soil. However, field observations made during the course of the survey reveal some useful general patterns of type and occurrence of mass slope movement as they relate to some of the soils in the county.

Mass movement is a common, natural geologic erosion process in the tectonically active northern Coast Range of California, of which Lake County is part. Certain land management activities within the county have the potential to accelerate the natural geologic process. Fire, road construction, building site development, timber harvesting operations, or other practices can destroy the stabilizing influence of plant cover, alter the hydrologic regime of a site, or interrupt the balanced strength-stress relationships existing within earth material. The resulting accelerated mass slope movement can reduce productivity of forest and range soils over large parts of affected watersheds; can damage roads, bridges, and other structures; and can have an adverse impact on the stream environment downstream.

Some existing land slips that were recognized on the landscape during the course of the survey are shown on the soil maps that are part of this publication. The use of slope stability maps made by qualified professionals and

site-specific investigation is recommended where detailed information is desired.

In the paragraphs that follow, some general factors that influence slope stability and some general types of mass slope movement that occur within the survey area are described.

Some general properties inherent in soil and underlying rock that influence strength-stress relationships are type and amount of clay, water content and pore pressure, geologic composition, geologic structure, and slope geometry.

Certain clay minerals are responsible for high plasticity, adsorption of great quantities of water, slow drainage, and the subsequent loss of shear strength in earth materials. In general, all material that is high in content of clay is potentially unstable; the hydration of clay minerals causes a loss of cohesion in the material. Soils and parent rock that are high in content of smectite clays, such as montmorillonite, are very likely to be unstable because of the added loss of cohesion when the clays swell upon wetting (*4*). Skyhigh and Sleeper soils are examples of soils that are high in content of smectite clays.

Water content and pore pressure are major factors affecting strength-stress relationships. Effective intergranular pressure and friction in soils are less in the saturated state because of the bouyant effect of water. Intergranular pressure because of capillary tension in moist soils is destroyed upon saturation, which results in the loss of shear strength. Changes can occur because of natural events, such as rainfall or snowmelt, and because of a host of human activities, such as diversion of streams, blockage of drainage, and clearing of vegetation and deforestation.

Some geological materials can be inherently weak or can become weak upon change in water content or other changes. Included, especially, are organic materials, sedimentary clay and shale, decomposed rock, rocks of volcanic tuff, and materials composed dominantly of soft, platy minerals such as mica, schist, or serpentine. Forward and Forward Variant soils formed in material derived from volcanic tuff; however, large, unstable areas in the map units of these soils generally were not observed. The Yorktree and Yorkville soils formed in material derived from rock that is high in content of soft, platy minerals such as chlorite and mica and generally are unstable. Areas of map units that include Henneke, Montara, and Okiota soils formed in material derived from serpentinitic rock and also appear to be unstable.

Considerations in geologic structure and slope geometry include discontinuities such as faults, bedding planes, strata inclined toward the free face of the slopes, and alternation of permeable beds, such as sandstone, and weak impermeable beds, such as shale.

External factors that influence strength-stress relationships in earth materials include gravity; erosion by streams and rivers, which produce natural slopes that are subject to sliding; added surcharge to the slope by weight of rainwater or snow, weight of vegetation, weight of construction fill, or weight of buildings or other structures; earthquakes; removal of underlying support such as undercutting of banks by streams or man; and lateral pressure caused by water in cracks or freezing of water in cracks.

Creep, slump-earthflow, block slide, debris avalanche, and debris torrent are the primary types of mass slope movement that occurs in the survey area.

Creep is slow, downslope movement of the soil mantle in response to gravitational forces. Movement occurs under shear stresses sufficient to produce deformation but too small to result in discrete failure. Interstitial and absorbed water contribute to creep movement by opening the structure within and between mineral grains and clay minerals, thereby reducing friction within the soil mass (*37*). Therefore, creep is mainly a function of gravitational forces but is facilitated by saturation with water and by frost action. Root strength, weight of vegetation, and wind stress on the soil mantle are also factors affecting creep.

Creep generally is the most persistent of all mass erosion processes. It operates at varying rates, dominantly in clayey soils, that occur even on relatively flat slopes. It can be recognized by the displacement of boulders, tilted poles and fences, and curved tree trunks. Some land management practices can modify the root strength, hydrology, and shear-strength relationships of a site and thereby accelerate the rate of creep. Creep activity can result in a continuing supply of soil material to streams in the form of encroaching banks and small-scale bank failures and thereby contribute to sediment loads in streams. Creep can also damage structures and roads. In areas where shear stresses are great enough, creep movement can accelerate into faster moving types of slope failure, mainly slump-earthflow.

Slump-earthflow is a combination of types of mass movement that commonly occur together. Slumping is the rotational movement of a block of earth over a broadly concave slip surface and involves very little breakup of the moving material. Where the slumping material moves downslope and is broken up, it forms an earthflow that moves like a viscous liquid. Commonly there is a slump basin with a headwall scarp at the top of the failure and an earthflow at the lower end of the failure.

Slump-earthflows commonly move at a slow rate over areas of less than an acre to more than several acres. In extreme cases the rate of movement can be fairly rapid. Many areas in the survey area appear to be presently inactive. A slump-earthflow can be recognized by a somewhat "hummocky" local topography, tipped and bowed trees, and open tension cracks in the soil surface. Tension cracks commonly are curved toward

the slide direction, and the foot of the slide is uplifted. The earthflow continues from the foot of the failure.

Areas of deep, cohesive, clay-rich soils and soft, clay-rich sedimentary bedrock are characterized by dominance of slow mass movement processes of creep and slump-earthflow. Gravity, saturation with water, and various strength-stress relationships within the earth material are the main influences affecting the occurrence of creep and slump-earthflow processes. Creep and slump-earthflow have been observed in some areas of Phipps, Pomo, Manzanita, Sanhedrin, Skyhigh, and Sleeper soils. Slump-earthflows have been observed to be a major occurrence in most areas of the Yorkville and Yorktree soils in the Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes. Slumping has also been observed in a few disturbed areas of Kekawaka soils.

Block slide, in rock or soil, is a mass movement in which soil material moves as a single unit on a relatively flat surface. Tension cracks in the slide material are nearly vertical, and there is no zone of uplift at the foot. The movement commonly is controlled structurally by surfaces of weakness, such as faults, joints, and bedding planes, by variations in shear strength between layers of bedded detritus, or by the contact between firm bedrock and overlying detritus. Some block slides can break up into individual masses as the slide moves, and the broken mass can change into an earthflow. Movement is slow to rapid. Block slides vary in size from less than 1 acre to many acres. Some very large landslides in the Coast Range are block slides.

There is particular danger of a block slide forming in areas marked by a system of strongly developed joints and bedding planes that dip steeply outward toward the natural slope. Water is not an important factor in causing block slides; however, in some instances water helps to weaken joints or bedding planes that would otherwise offer high frictional resistance. Areas of map units containing Deadwood, Freezeout, Neuns, or Sheetiron soils are examples of areas in which joints or bedding planes in the underlying rock commonly dip outward toward the natural slope.

Debris avalanches are rapid, shallow-soil mass movements from steeply sloping areas. They commonly are triggered by infrequent, intense storms. Debris avalanches leave scars in the form of spoon-shaped depressional areas on the slope. Shallow, noncohesive, steep soils where subsurface water may be concentrated on bedrock surfaces are prone to this type of slope failure. Examples are Etsel, Deadwood, and Neuns soils. Because debris avalanches are shallow failures, factors such as root strength and anchoring effects and the transfer of wind stress to the soil mantle are potentially important influences.

Debris torrents involve the rapid movement of water-charged soil, rock, and organic material down steep, intermittent, first- and second-order stream channels. These events are triggered during extreme discharge events by slides from adjacent hillslopes, which enter the channel and move directly downstream, or by the breakup and mobilization of debris accumulations in the channel. As the torrent moves downstream, large areas of the channel can be scoured. When a torrent loses momentum, there is a deposition of a tangled mass of debris. Debris torrents pose significant environmental hazards in the mountainous areas where they occur.

Proper drainage of surface water is probably the most important measure that can be employed to increase slope stability (*37*). Drainage will both reduce the weight of the mass tending to slide and increase the strength of the slope-forming material. It is especially important that water be diverted from the top of the slope. Water can enter cracks, and the increased hydrostatic head could cause the slope to fail. Keeping a slope dry is very important if man is going to overload the slope.

If confined permeable sand or gravel layers are present in the slope, it is advisable to construct subsurface drains to reduce the hydrostatic head. For this reason, an investigation of subsurface soils is recommended if construction is planned on the slope.

The bottom of a slope should not be removed if the slope is suspected of being unstable. If excavation is necessary at the bottom of a slope, the excavated area should be at or near the angle of the natural slope.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. The data and the estimates of soil and water features listed in tables are explained on the following pages.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties shown in the tables include the range of grain-size distribution and Atterberg limits, the engineering classifications, and the physical and chemical properties of the major layers of each soil. Pertinent soil and water features also are given.

Engineering Index Properties

Table 15 gives estimates of the engineering classification and of the range of index properties for the major layers of each soil in the survey area. Most soils have layers of contrasting properties within the upper 5 to 6 feet.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Taxonomic Units and Their Morphology."

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters in diameter. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is as much as 15 percent, an appropriate modifier is added; for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the system adopted by the American Association of State Highway and Transportation Officials (*1*) and the Unified soil classification system (*2*).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to grain-size distribution of the fraction less than 3 inches in diameter and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification; for example, SP-SM.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches in diameter is classified in one of seven groups from A-1 through A-7 on the basis of grain-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

Rock fragments larger than 3 inches in diameter are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches in diameter based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and *plasticity index* (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of grain-size distribution, liquid limit, and plasticity index are rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is omitted in the table.

Physical and Chemical Properties

Table 16 shows estimates of some characteristics and features that affect soil behavior. These estimates are given for the major layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated. The range in depth and information on other properties of each layer are given for each taxonomic unit under "Taxonomic Units and Their Morphology."

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter in diameter. In this table, the estimated clay content of each major soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The amount and kind of clay greatly affect the fertility and physical condition of the soil. They determine the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earth-moving operations.

Permeability refers to the ability of a soil to transmit water or air. The estimates indicate the rate of downward movement of water when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems, septic tank absorption fields, and construction where the rate of water movement under saturated conditions affects behavior.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each major soil layer. The capacity varies, depending on soil properties that affect the retention of water and the depth of the root zone. The most important properties are the content of organic matter, soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Soil reaction is a measure of acidity or alkalinity and is expressed as a range in pH values. The range in pH of each major horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Shrink-swell potential is the potential for volume change in a soil with a loss or gain in moisture. Volume change occurs mainly because of the interaction of clay minerals with water and varies with the amount and type of clay minerals in the soil. The size of the load on the soil and the magnitude of the change in soil moisture content influence the amount of swelling of soils in place. Laboratory measurements of swelling of undisturbed clods were made for many soils. For others, swelling was estimated on the basis of the kind and amount of clay minerals in the soil and on measurements of similar soils.

If the shrink-swell potential is rated moderate to very high, shrinking and swelling can cause damage to buildings, roads, and other structures. Special design is often needed.

Shrink-swell potential classes are based on the change in length of an unconfined clod as moisture content is increased from air-dry to field capacity. The change is based on the soil fraction less than 2 millimeters in diameter. The classes are *low*, a change of less than 3 percent; *moderate*, 3 to 6 percent; and *high*, more than 6 percent. *Very high*, more than 9 percent, is sometimes used.

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) to predict the average rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, very fine sand, sand, and organic matter (as much as 4 percent) and on soil structure and permeability. The estimates are modified by the presence of rock fragments. Values of K range from 0.02 to 0.69. The higher the value the more susceptible the soil is to sheet and rill erosion.

Erosion factor T is an estimate of the maximum average rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Organic matter is the plant and animal residue in the soil at various stages of decomposition.

In table 16, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters in diameter.

The content of organic matter of a soil can be maintained or increased by returning crop residue to the soil. Organic matter affects the available water capacity, infiltration rate, and tilth. It is a source of nitrogen and other nutrients for crops.

Soil and Water Features

Table 17 gives estimates of various soil and water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are used to estimate runoff from precipitation. Soils not protected by vegetation are assigned to one of four groups. They are grouped according to the intake of water when the soils are thoroughly wet and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sand or gravelly sand. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potenital) when thoroughly wet. These consist chiefly of clay that has high shrink-swell potential, soils that have a permanent high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

Flooding, the temporary covering of the soil surface by flowing water, is caused by overflow from streams, by runoff from adjacent slopes, or by inflow from high tides. Shallow water standing or flowing for short periods after rainfall or snowmelt is not considered to be flooding. Standing water in swamps and marshes or in closed depressional areas is considered to be ponding.

Table 17 gives the frequency and duration of flooding and the time of year when flooding is most likely to occur.

Frequency, duration, and probable period of flooding are estimated. Frequency is expressed as *none, rare, occasional,* frequent. *None* means that flooding is not probable, *rare* that it is unlikely but is possible under unusual weather conditions (chance of flooding in any year is 0 to 5 percent), *occasional* that it occurs infrequently under normal weather conditions (chance of flooding in any year is 5 to 50 percent), and *frequent* that it occurs often under normal weather conditions (chance of flooding in any year is more than 50 percent).

Duration is expressed as *very brief* (less than 2 days), *brief* (2 to 7 days), *long* (7 days to 1 month), and *very long* (more than 1 month). The time of year that flooding is most likely to occur is expressed in months. November-May, for example, means that flooding can occur during the period November through May. About two-thirds to three-fourths of all flooding occurs during the stated period.

The information on flooding is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and absence of distinctive horizons, which are characteristic of soils that are not subject to flooding.

Also considered are local information about the extent and level of flooding and the relation of each soil on the landscape to historic flood. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

High water table (seasonal) is the highest level of a saturated zone in the soil in most years. The depth to a seasonal high water table applies to undrained soils. The estimates are based mainly on the evidence of a saturated zone, namely grayish colors or mottles in the soil. Indicated in table 17 are the depth to the seasonal high water table; the kind of water table—that is, *perched, artesian,* or *apparent*; and the months of the year that the water table usually is highest. A water table that is seasonally high for less than 1 month is not indicated in the table.

An *apparent* water table is a thick zone of free water in the soil. It is indicated by the level at which water stands in an uncased borehole after adequate time is allowed for adjustment in the surrounding soil. An *artesian* water table is under hydrostatic head, generally below an impermeable layer. When this layer is penetrated, the water level rises in an uncased borehole. A *perched* water table is water standing above an unsaturated zone. In places an upper, or perched, water table is separated from a lower water table by a dry zone.

The two numbers in the column "High water table" indicate the normal range in depth to a saturated zone. Depth is given to the nearest half foot. The first numeral in the range indicates the highest water level. A plus sign preceding the range in depth indicates that the water table is above the surface of the soil. "More than 6.0" indicates that the water table is below a depth of 6 feet or that the water table exists for less than a month.

Depth to bedrock is given if bedrock is within a depth of 5 feet. The depth is based on many soil borings and on observations during soil mapping. The rock is specified as either soft or hard. If the rock is soft or fractured, excavations can be made with trenching machines, backhoes, or small rippers. If the rock is hard or massive, blasting or special equipment generally is needed for excavation.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that dissolves or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors creates a severe corrosion environment. The steel in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than steel in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class,

total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion is also expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (*32*). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 18 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Ten soil orders are recognized and six of these occur in Lake County. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in *sol*. An example is Alfisol. Following is a brief discussion of the soil orders in Lake County.

Alfisols are commonly light colored soils that have an accumulation of translocated clay in the profile. Base saturation is more than 35 percent, and water is available to plants for at least 3 months each year when the soil is warm enough for plants to grow. Alfisols are the dominant soil order in Lake County. Bressa, Kekawaka, Konocti, and Manzanita soils are typical Alfisols.

Entisols are soils that have no pedogenic horizons or have only the beginning of such horizons. Etsel and Yollabolly soils are typical Entisols.

Inceptisols are soils in which definite horizons have started to develop. They have one or two horizons that do not show significant accumulation of translocated materials other than amorphous silica or exhibit extreme weathering. Kidd, Maymen, and Neuns soils are typical Inceptisols.

Mollisols are soils that have a thick, dark-colored surface layer that is high in content in humus and are friable. Base saturation is high. They may or may not have a content of translocated clay. Cole, Lupoyoma, and Still soils are typical Mollisols.

Ultisols are soils that have an accumulation of translocated clay in the profile. Base saturation is less than 35 percent and decreases with increasing depth. Aiken soils are the only Ultisols in the county, but in the northern part of the survey area, where precipitation is high, soils are trending toward Ultisols.

Vertisols are clayey soils that shrink and swell and that have deep, wide cracks at some time of the year. Clear Lake and Maxwell soils are typical Vertisols.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Xeralf (*Xer*, meaning moist in winter and dry in summer, reflecting a Mediterranean-type climate, plus *alf*, from Alfisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Haploxeralfs (*Haplo*, meaning simple horizons, plus *xer*, for moist in winter and dry in summer, and *alf*, from Alfisol).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other known kind of soil. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective *Typic* identifies the subgroup that typifies the great group. An example is Typic Haploxeralfs.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Mostly the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineral content, temperature regime, thickness of the root zone, consistence, moisture equivalent, slope, and permanent cracks. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, mesic Typic Haploxeralfs.

SERIES. The series consists of soils that have similar horizons in their profile. The horizons are similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. The texture of the surface layer or of the substratum can differ within a series.

Taxonomic Units and Their Morphology

In this section, each taxonomic unit recognized in the survey area is described. The descriptions are arranged in alphabetic order.

Characteristics of the soil and the material in which it formed are identified for each unit. A pedon, a small three-dimensional area of soil, that is typical of the unit in the survey area is described. The detailed description of each soil horizon follows standards in the *Soil Survey Manual* (*28*). Many of the technical terms used in the descriptions are defined in *Soil Taxonomy* (*32*). Unless otherwise stated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the unit.

The map units of each taxonomic unit are described in the section "Detailed Soil Map Units."

Aiken Series

The Aiken series consists of very deep, well drained soils on hills and mountains. These soils formed in material weathered from andesite, basalt, and dacite. Slope is 5 to 50 percent.

Soils of the Aiken series are clayey, oxidic, mesic Xeric Haplohumults.

Typical pedon of an Aiken loam in an area of Collayomi-Aiken-Whispering complex, 5 to 30 percent slopes, in Boggs Mountain State Forest, at a point 1.4 miles northeast of Whispering Pines; 1,950 feet east of the northwest corner of sec. 12, T. 11 N., R. 8 W., Whispering Pines quadrangle.

O1 and O2—1 inch to 0; decomposed and partially decomposed conifer needles, twigs, and bark.

A11—0 to 5 inches; reddish brown (5YR 5/4) loam, reddish brown (5YR 4/4) moist; moderate very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular and interstitial pores; 5 percent pebbles 2 to 50 millimeters in diameter; medium acid; abrupt wavy boundary.

A12—5 to 9 inches; reddish brown (5YR 5/4) clay loam, reddish brown (5YR 4/4) moist; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; common very fine tubular pores and many very fine interstitial pores; 5 percent pebbles 2 to 75 millimeters in diameter; medium acid; gradual wavy boundary.

B1—9 to 20 inches; yellowish red (10YR 5/6) clay loam, yellowish red (5YR 4/6) moist; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; common very fine and fine tubular and interstitial pores; 10 percent pebbles 2 to 75 millimeters in diameter; strongly acid; gradual wavy boundary.

B21—20 to 33 inches; reddish yellow (5YR 6/6) clay, yellowish red (5YR 4/6) moist; weak very fine, fine, and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine and few medium tubular and interstitial pores; 10 percent pebbles 2 to 75 millimeters in diameter; strongly acid; clear wavy boundary.

B22t—33 to 44 inches; reddish yellow (5YR 6/6) clay, yellowish red (5YR 4/6) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine tubular pores and common very fine interstitial pores; few thin clay films on peds and in pores; 10 percent pebbles 2 to 75 millimeters in diameter; medium acid; gradual wavy boundary.

B23t—44 to 61 inches; reddish yellow (5YR 6/6) clay, yellowish red (5YR 4/6) moist; weak medium and coarse subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few very fine, fine, and medium roots; common very fine tubular and interstitial pores; common moderately thick clay films on peds and in pores; 10 percent pebbles 2 to 75 millimeters in diameter; medium acid; clear irregular boundary.

B24t—61 to 74 inches; reddish yellow (5YR 6/6) cobbly clay, yellowish red (5YR 4/6) moist; weak medium subangular and angular blocky structure; slightly hard, firm, sticky and slightly plastic; few very fine and fine roots; few very fine tubular and interstitial pores; common moderately thick clay films on peds and in pores; 10 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 150 millimeters in diameter; strongly acid.

Thickness of the solum and depth to weathered bedrock are more than 60 inches. The mean annual soil temperature is 51 to 55 degrees F. The part of the profile between depths of 4 and 12 inches is dry in all parts from July 15 to October 15 and is moist in all parts from December 1 to May 15. Base saturation (sum of cations) is 15 to 35 percent throughout the profile. Organic carbon content of the upper 9 inches is 1.5 to 4.5 percent and remains more than 1.0 percent throughout the upper 20 inches.

The A horizon has color of 7.5YR 4/4 or 5YR 4/3, 5/3, 5/4, or 5/6. Moist color is 7.5YR or 5YR 3/2, 3/3, 3/4, or 4/4. Reaction is slightly acid or medium acid.

The B2t horizon has color of 5YR 4/4, 5/6, 6/4, 6/6, or 7/6. Moist color is 5YR 3/4 or 4/6 or 2.5YR 3/6. The horizon is clay loam or clay and has 35 to 55 percent clay. There are significant amounts of weatherable

minerals present. Reaction is medium acid to very strongly acid.

Arrowhead Series

The Arrowhead series consists of moderately deep, well drained soils on volcanic hills. These soils formed in material weathered from obsidian. Slope is 5 to 50 percent.

Soils of the Arrowhead series are clayey-skeletal, mixed, mesic Ultic Haploxeralfs.

Typical pedon of an Arrowhead extremely gravelly sandy loam in an area of Bottlerock-Glenview-Arrowhead complex, 5 to 30 percent slopes, about 2,800 feet east of Bottlerock Road, about 3 miles south of its intersection with Cole Creek Road; 600 feet south and 1,600 feet west of the northeast corner of sec. 7, T. 12 N., R. 8 W.; Kelseyville quadrangle.

A11—0 to 1 inch; brown (10YR 5/3) extremely gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; loose, very friable, nonsticky and nonplastic; many very fine, fine, and medium roots; common very fine interstitial pores and few fine and medium tubular pores; 85 percent angular obsidian pebbles 2 to 25 millimeters in diameter occurring as a surface pavement; slightly acid; abrupt wavy boundary.

A12—1 to 4 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots and few medium roots; common very fine interstitial pores and few fine and medium tubular pores; 15 percent angular obsidian pebbles 2 to 25 millimeters in diameter; slightly acid; abrupt wavy boundary.

B1t—4 to 8 inches; brown (7.5YR 5/3) gravelly sandy loam, dark brown (7.5YR 4/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine and fine interstitial pores; common medium and few coarse tubular pores; few thin clay films in pores; 25 percent angular obsidian pebbles 2 to 25 millimeters in diameter; slightly acid; clear irregular boundary.

B21t—8 to 14 inches; light brown (7.5YR 6/4) gravelly sandy clay loam, yellowish red (5YR 5/6) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; many very fine and fine roots and common medium and coarse roots; many very fine and fine interstitial pores, common medium tubular pores, and few coarse tubular pores; few thin clay films in pores; 25 percent angular obsidian pebbles 2 to 25 millimeters in diameter; slightly acid; gradual wavy boundary.

B22t—14 to 31 inches; reddish yellow (7.5YR 6/6) very stony clay, strong brown (7.5YR 5/6) moist; weak very fine angular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots, common medium roots, and few coarse roots; many very fine and common fine interstitial pores and few fine and medium tubular pores; common thin and moderately thick clay films on peds and in pores; 20 percent angular obsidian cobbles 75 to 250 millimeters in diameter and 35 percent angular obsidian stones 250 to 600 millimeters in diameter; slightly acid; gradual irregular boundary.

R—31 inches; hard, fractured obsidian with soil-filled fractures 5 to 40 millimeters wide and 80 to 400 millimeters apart.

Thickness of the solum and depth to lithic contact is 20 to 40 inches. The mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 8 and 28 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 15. The particle-size control section is 35 to 45 percent clay. It is neutral or slightly acid throughout. Mineralogy is influenced by amorphous material. Base saturation (sums of cations) is 50 to 75 percent throughout the profile.

The A horizon has color of 7.5YR 6/3 or 7/3 or 10YR 5/3, 6/4, or 7/4. Moist color is 7.5YR 5/3 or 6/3 or 10YR 3/2, 4/2, or 4/3. Angular obsidian fragments 2 to 25 millimeters in diameter cover 75 to 95 percent of the soil surface as an erosion pavement. Below the erosion pavement, the A horizon contains 15 to 35 percent pebbles.

The B2t horizon has color of 5YR 6/6 or 7/6, 7.5YR 4/6, 6/4, or 6/6, or 10YR 6/4 or 6/6. Moist color is 5YR 4/6 or 5/6, 7.5YR 4/3, 4/4, or 5/6, or 10YR 6/4. It is gravelly clay loam, gravelly sandy clay loam, cobbly clay loam, very stony clay, or very cobbly clay. This horizon is 35 to 60 percent rock fragments consisting of pebbles, cobbles, and stones.

Asbill Series

The Asbill series consists of moderately deep, well drained soils on hills. These soils formed in material weathered from shale or siltstone. Slope is 5 to 50 percent.

Soils of the Asbill series are fine, montmorillonitic, thermic Typic Chromoxererts.

Typical pedon of Asbill clay loam, 5 to 8 percent slopes, about 800 feet east of Adobe Creek Drive at a point about 0.75 mile south of its intersection with Wight Way; 1,700 feet north and 200 feet east of the southwest corner of sec. 33, T. 14 N., R. 9 W., Highland Springs quadrangle.

A11—0 to 5 inches; olive gray (5Y 5/2) clay loam, olive gray (5Y 4/2) moist; moderate medium and coarse subangular blocky structure; hard, firm, slightly sticky and plastic; common very fine and few medium roots; few very fine and fine tubular pores; few pressure faces; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

A12—5 to 13 inches; olive gray (5Y 5/2) clay loam, dark olive gray (5Y 3/2) moist; moderate coarse and very coarse subangular blocky structure; hard, firm, slightly sticky and plastic; few very fine and medium roots; few very fine and fine interstitial pores; few pressure faces; slightly effervescent; disseminated lime; moderately alkaline; gradual wavy boundary.

AC—13 to 27 inches; olive gray (5Y 4/2) clay, dark olive gray (5Y 3/2) moist; weak medium and coarse prismatic structure; very hard, very firm, sticky and plastic; few fine and medium roots; few very fine and fine interstitial pores; common pressure faces and intersecting slickensides; strongly effervescent; few irregular medium soft masses of lime; moderately alkaline; clear wavy boundary.

C1ca—27 to 39 inches; light olive gray (5Y 6/2) clay, olive gray (5Y 4/2) moist; weak coarse angular blocky structure; very hard, very firm, sticky and plastic; few fine and medium roots concentrated along vertical faces and peds; few very fine and fine interstitial pores; violently effervescent; lime segregated in many medium and large soft masses; moderately alkaline; gradual irregular boundary.

C2r—39 inches; light olive gray (5Y 6/3) very soft siltstone; strongly effervescent.

Depth to a paralithic contact is 20 to 40 inches. The mean annual soil temperature is 59 to 62 degrees F. Cracks open and close once a year. Vertical cracks are 50 to 100 centimeters deep and 2 to 10 millimeters wide and are fully open from July 1 to October 15 and are fully closed from January 1 to April 30. Few to common slickensides are present in at least the lower part of the A horizon and the upper part of the C horizon. The profile is clay loam, clay, or silty clay with 35 to 50 percent clay. The upper part of the A horizon has a clay content of 30 to 40 percent. The soils are calcareous and moderately alkaline throughout.

The A horizon has color of 10YR 5/2, 5/3, or 6/2, 2.5Y 4/2, 5/2, or 6/2, or 5Y 4/2 or 5/2. Moist color is 10YR 3/2, 3/3, or 4/2, 2.5Y 3/2, 4/2, or 5/2, or 5Y 3/2 or 4/2. Color value is 5 or less when dry and 3 or less when moist in at least half of the upper 12 to 15 inches.

The C horizon has color of 2.5Y 4/2, 5/2, or 6/2 or 5Y 5/2, 6/2, or 6/3. Moist color is 2.5Y 3/2, 4/2, or 5/2 or 5Y 4/2, 5/2, or 5/3.

Bally Series

The Bally series consists of very deep, well drained soils on uplifted and dissected hills. These soils formed in alluvium derived from mixed sources. Slope is 2 to 50 percent.

Soils of the Bally series are clayey-skeletal, mixed, thermic Typic Haploxeralfs.

Typical pedon of a Bally gravelly sandy clay loam in an area of Bally-Phipps complex, 15 to 30 percent slopes, 1 mile east of State Highway 53 on Davis Street, 10 feet north of the road; 50 feet north and 2,000 feet east of the southwest corner of sec. 23, T. 13 N., R. 7 W., Lower Lake quadrangle.

A1—0 to 2 inches; yellowish brown (10YR 5/4) gravelly sandy loam, brown (10YR 4/3) moist; weak fine subangular blocky structure parting to moderate fine granular; soft, very friable, nonsticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores and few fine tubular pores; 20 percent rounded pebbles 2 to 50 millimeters in diameter; neutral; clear wavy boundary.

B1t—2 to 10 inches; yellowish brown (10YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine interstitial pores and few fine tubular pores; few thin clay films in pores; 15 percent rounded pebbles 2 to 75 millimeters in diameter; slightly acid; clear wavy boundary.

IIB21t—10 to 18 inches; variegated brown (7.5YR 5/4) and reddish yellow (7.5YR 7/8) very gravelly sandy clay loam, dark brown (7.5YR 4/4) and reddish yellow (7.5YR 7/8) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine, fine, and medium roots; common very fine and fine interstitial pores and fine tubular pores; few thin clay films in pores; 35 percent rounded pebbles 2 to 75 millimeters in diameter and 15 percent rounded cobbles 75 to 180 millimeters in diameter; slightly acid; gradual wavy boundary.

IIB22t—18 to 37 inches; variegated brown (7.5YR 5/4) and reddish yellow (7.5YR 7/8) very gravelly sandy clay, brown (7.5YR 5/4) and reddish yellow (7.5YR 7/8) moist; moderate medium angular blocky structure; hard, friable, very sticky and plastic; few fine roots; few very fine and fine interstitial pores; many thick clay films on peds and on rock fragments; 40 percent rounded pebbles 2 to 75 millimeters in diameter and 10 percent rounded cobbles 75 to 200 millimeters in diameter; slightly acid; gradual wavy boundary.

C—37 to 65 inches; variegated brown (7.5YR 5/4) and reddish yellow (7.5YR 7/8) very gravelly sandy clay loam, brown (7.5YR 5/4) and reddish yellow (7.5YR 7/8) moist; massive; slightly hard, friable, very sticky and plastic; few very fine and fine interstitial pores; many thick clay films on rock fragments; 50 percent

rounded pebbles 2 to 75 millimeters in diameter and 5 percent rounded cobbles 75 to 200 millimeters in diameter; neutral.

Thickness of the solum is 30 to 50 inches, and the depth of the soil is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 7 and 29 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. Reaction is slightly acid to neutral throughout the profile. Content of coarse and very coarse sand is 15 to 25 percent throughout. Base saturation (sum of cations) is 75 to 95 percent throughout.

The A horizon has color of 10YR 3/3, 4/3, 4/4, or 5/4. Moist color is 10YR 2/2, 3/2, or 4/3. Where moist values are 2 or 3, the horizon is 1 to 4 inches thick. The horizon is gravelly loam or gravelly sandy clay loam.

The B2t horizon has color of 7.5YR 4/4, 5/4, or 7/8. Moist color is 7.5YR 3/4, 4/4, 5/4, or 7/8 or 10YR 4/3 or 4/4. The horizon is clay loam, sandy clay loam, clay, or sandy clay that is 35 to 60 percent rock fragments and 25 to 55 percent clay. The particle-size control section averages 35 to 45 percent clay and 35 to 50 percent rock fragments.

The C horizon is sandy clay loam or clay loam that is 50 to 60 percent rock fragments. Clay content commonly is 20 to 35 percent.

Bamtush Series

The Bamtush series consists of very deep, well drained soils on mountains. These soils formed in material weathered from hard sandstone, shale, or greenstone. Slope is 15 to 75 percent.

Soils of the Bamtush series are loamy-skeletal, mixed, mesic Ultic Palexeralfs.

Typical pedon of a Bamtush gravelly loam in an area of Bamtush-Speaker-Sanhedrin gravelly loams, 30 to 50 percent slopes, in Mendocino National Forest, 50 feet downslope of Road 1N02 at a point 0.4 mile south of its intersection with Road 17N23; about 1,900 feet south and 2,200 feet west of the northeast corner of sec. 4, T. 17 N., R. 10 W., Elk Mountain quadrangle.

O1 and O2—1 inch to 0; decomposed and partially decomposed conifer needles, black oak leaves, twigs, and bark.

A1—0 to 7 inches; brown (7.5YR 5/4) gravelly loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots and common coarse roots; many very fine and medium interstitial pores and common coarse interstitial pores; 30 percent pebbles 2 to 30 millimeters in diameter; slightly acid; clear wavy boundary.

B1t—7 to 17 inches; brown (7.5YR 5/4) very gravelly loam, strong brown (7.5YR 4/6) moist; moderate fine and medium subangular blocky structure parting to moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; many very fine, fine, and medium interstitial pores and common coarse interstitial pores; few thin clay films on peds and in pores; 40 percent pebbles 2 to 30 millimeters in diameter; slightly acid; gradual wavy boundary.

B21t—17 to 31 inches; strong brown (7.5YR 5/6) very gravelly loam, yellowish red (5YR 5/6) moist; strong fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and plastic; many fine and medium roots; common very fine, fine, and medium interstitial pores; common moderately thick clay films on peds and in pores; 30 percent of peds have dark reddish brown (5YR 3/2) stains; 50 percent pebbles 2 to 50 millimeters in diameter; medium acid; gradual wavy boundary.

B21t—31 to 59 inches; strong brown (7.5YR 5/6) very gravelly loam, yellowish red (5YR 5/6) moist; strong fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots and few very fine and coarse roots; common very fine, fine, and medium interstitial pores; common moderately thick clay films on peds and in pores; 60 percent of peds have dark reddish brown (5YR 3/2) stains; 55 percent pebbles 2 to 75 millimeters in diameter; medium acid; clear wavy boundary.

B3t—59 to 63 inches; strong brown (7.5YR 5/6) very gravelly loam, yellowish red (7.5YR 5/6) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; common very fine, fine, and medium interstitial pores; common moderately thick clay films on peds and in pores; 70 percent of peds have dark reddish brown (5YR 3/2) stains; 45 percent hard pebbles and 15 percent soft sandstone pebbles 2 to 75 millimeters in diameter; medium acid.

Thickness of the solum and depth of the profile are 60 to 80 inches. The mean annual soil temperature is 53 to 58 degrees F. The part of the profile between depths of 8 and 28 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to May 15. The particle-size control section averages 25 to 35 percent clay and 35 to 60 percent rock fragments. Base saturation (sum of cations) is 60 to 70 percent at the surface and decreases with depth to about 50 percent.

The A horizon has color of 7.5YR 4/4 or 5/4 or of 10YR 4/3, 4/4, 5/3, or 5/4. Moist color is 7.5YR 4/2 or 4/4 or 10YR 4/2, 4/3, or 4/4.

The B2t horizon has color of 5YR 4/6 or 5/6 or of 7.5YR 5/4, 5/6, or 6/6. Moist color is 5YR 4/4, 5/4, or

5/6 or 7.5YR 4/6. Chroma is more than 4 in at least the lower part of the B2t horizon. The horizon is very gravelly loam or very gravelly clay loam and commonly is 22 to 35 percent clay. The clay content continues to increase in the lower part of the B2t horizon and increases or decreases only slightly in the B3t horizon. The horizon is slightly acid to strongly acid.

Benridge Series

The Benridge series consists of very deep, well drained soils on hills and mountains. These soils formed in material weathered from volcanic ash, breccia, or tuff. Slope is 8 to 75 percent.

Soils of the Benridge series are fine, mixed, thermic Mollic Palexeralfs.

Typical pedon of a Benridge loam in an area of Benridge-Konocti association, 30 to 50 percent slopes, about 20 feet east of Konocti Road, at a point about 600 feet north of the first hairpin turn going up the hill; about 2,600 feet south and 2,000 feet east of the northwest corner of sec. 13, T. 13 N., R. 9 W., Kelseyville quadrangle.

A1—0 to 6 inches; light brown (7.5YR 6/4) loam, dark reddish brown (5YR 3/4) moist; strong medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; common fine and medium interstitial pores and few medium and coarse tubular pores; 12 percent pebbles 2 to 25 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

B21t—6 to 21 inches; yellowish red (5YR 4/6) gravelly clay loam, dark reddish brown (5YR 3/4) moist; strong medium and coarse subangular blocky structure; hard, friable, sticky and plastic; weakly smeary; few very fine and fine roots; common very fine interstitial pores and common fine and coarse tubular pores; many moderately thick clay films on peds and in pores; 17 percent pebbles 2 to 50 millimeters in diameter; neutral; clear wavy boundary.

B22t—21 to 50 inches; yellowish red (5YR 4/6) gravelly clay loam, dark reddish brown (5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; weakly smeary; few very fine roots; common very fine and fine interstitial pores and common medium and few coarse tubular pores; many moderately thick clay films on peds and in pores; 25 percent pebbles 2 to 75 millimeters in diameter and 2 percent cobbles 75 to 100 millimeters in diameter; neutral; gradual smooth boundary.

B23t—50 to 63 inches; yellowish red (5YR 5/6) gravelly clay loam, red (2.5YR 4/6) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; weakly smeary; few very fine and fine roots; common very fine and fine interstitial and tubular pores; 20 percent pebbles 2 to 50 millimeters in diameter; many thick clay films on peds and in pores; neutral; gradual smooth boundary.

B24t—63 to 68 inches; yellowish red (5YR 5/6) clay, reddish brown (5YR 4/4) moist; strong fine and medium subangular blocky structure; very hard, firm, sticky and plastic; weakly smeary; few very fine interstitial and tubular pores; 8 percent pebbles 2 to 50 millimeters in diameter; many thick clay films on peds and in pores; neutral.

R—68 inches; volcanic breccia.

Thickness of the solum and depth of the profile are 60 to 80 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 6 and 19 inches is dry in all parts from June 1 to October 15 and is moist in all parts from December 1 to March 30. Mineralogy is influenced by the presence of amorphous material.

The A horizon has color of 7.5YR 6/2 or 6/4 or of 10YR 6/3 or 6/4. Moist color is 5YR, 7.5YR, or 10YR 3/4. The horizon is neutral or mildly alkaline. Clay content is 15 to 25 percent.

The B2t horizon has color of 5YR 4/6, 5/6, 6/4, or 6/6. Moist color is 2.5YR 4/6 or 5YR 3/4, 4/4, or 4/6. Chroma is more than 4 in at least the lower part of the horizon. It is clay, gravelly clay, clay loam, or gravelly clay loam. The particle-size control section is 35 to 50 percent clay and 5 to 30 percent rock fragments. Clay content continues to increase with increasing depth to more than 60 inches.

Benridge Variant

The Benridge Variant consists of moderately deep, well drained soils on hillslopes at valley sides. These soils formed in material weathered from basaltic tuff. Slope is 2 to 15 percent.

Soils of the Benridge Variant are fine, mixed, thermic Mollic Palexeralfs.

Typical pedon of Benridge Variant loam, 2 to 15 percent slopes, 1,600 feet southwest of Butts Canyon Road, at a point 0.4 mile northwest of its intersection with Oat Hill Road; Lat. 38°43'22' N. and Long. 122°33'6' W. (in an unsectionalized area), Detert Reservoir quadrangle.

A1—0 to 6 inches; reddish brown (5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine tubular and interstitial pores; 8 percent pebbles 2 to 75 millimeters in diameter; neutral; clear smooth boundary.

A3—6 to 11 inches; light reddish brown (5YR 6/4) loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores and common very fine interstitial pores; 8 percent pebbles 2 to 75 millimeters in diameter; slightly acid; abrupt wavy boundary.

IIB2t—11 to 24 inches; pale yellow (2.5Y 7/4) gravelly clay, light yellowish brown (2.5Y 6/4) moist; common fine and medium subangular blocky structure; very hard, firm, very sticky and very plastic; common very fine, fine, medium, and coarse roots; few very fine tubular pores; many thick clay films on peds and in pores; 20 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 250 millimeters in diameter; slightly acid; abrupt irregular boundary.

IICr—24 to 50 inches; weathered tuff with rounded cobbles and stones of basalt imbedded within; few fine and medium roots in fractures; many moderately thick and thick clay films in fractures.

Thickness of the solum and depth to the paralithic contact are 20 to 40 inches. The mean annual soil temperature is 60 to 63 degrees F. The part of the profile between depths of 6 and 24 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. The profile is slightly acid to neutral throughout. Pebbles and cobbles make up 5 to 35 percent of the profile.

The A1 horizon has color of 5YR 5/3 or 5/4 or of 7.5YR 5/4. Moist color is 5YR 3/3, 3/4, 4/3, or 4/4 or 7.5YR 4/4. Moist values of 3 extend to a depth of 4 to 6 inches. Some pedons do not have an A3 horizon.

The B2t horizon has color of 10YR or 2.5Y 6/4 or 7/4. Moist color is 10YR or 2.5YR 5/4 or 6/4. The horizon is gravelly clay or gravelly clay loam that is 35 to 55 percent clay.

Bottlerock Series

The Bottlerock series consists of very deep, well drained soils on volcanic hills. These soils formed in material weathered from obsidian. Slope is 2 to 50 percent.

Soils of the Bottlerock series are loamy-skeletal, mixed, mesic Ultic Palexeralfs.

Typical pedon of a Bottlerock extremely gravelly loam in an area of Bottlerock-Glenview-Arrowhead complex, 5 to 30 percent slopes, 10 feet west of access road, 550 feet west of Bottlerock Road, at a point about 3 miles south of its intersection with Cold Creek Road; 750 feet south and 250 feet east of the northwest corner of sec. 7, T. 12 N., R. 8 W., Kelseyville quadrangle.

A11—0 to 1 inch; dark grayish brown (10YR 4/2) extremely gravelly loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; weakly smeary; few very fine and fine roots; many medium and coarse interstitial pores; 90 percent obsidian pebbles 2 to 50 millimeters in diameter occuring as a gravel pavement; medium acid; abrupt smooth boundary.

A12—1 to 5 inches; dark grayish brown (10YR 4/2) extremely gravelly loam, very dark brown (10YR 2/2) moist; weak very fine granular structure; soft, very friable, slightly sticky and nonplastic; weakly smeary; common very fine and fine roots and few medium roots; few very fine, fine, medium, and coarse interstitial pores; 80 percent pebbles 2 to 50 millimeters in diameter; medium acid; abrupt smooth boundary.

A13—5 to 9 inches; light gray (10YR 7/2) very gravelly loam, brown (10YR 4/3) moist; weak fine subangular blocky structure parting to common fine and medium granular; soft, very friable, slightly sticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and common fine interstitial pores and common fine and few medium tubular pores; 20 percent shot 2 to 5 millimeters in diameter and 25 percent pebbles 2 to 25 millimeters in diameter; slightly acid; abrupt wavy boundary.

A3—9 to 19 inches; very pale brown (10YR 7/3) very gravelly loam, yellowish brown (10YR 4/3) moist; moderate fine subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and nonplastic; weakly smeary; common fine and medium roots and few coarse and very coarse roots; many very fine and fine interstitial pores and common fine and medium tubular pores; 20 percent shot 2 to 5 millimeters in diameter and 25 percent pebbles 2 to 25 millimeters in diameter; slightly acid; clear wavy boundary.

B1t—19 to 28 inches; very pale brown (10YR 7/3) very gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine, medium, and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; few fine, medium, and coarse roots; many very fine and fine interstitial pores and common fine and medium tubular pores; few thin clay films on peds; 20 percent shot 2 to 8 millimeters in diameter and 20 percent pebbles 2 to 25 millimeters in diameter; medium acid; gradual wavy boundary.

B21t—28 to 39 inches; light brown (7.5YR 6/4) very gravelly clay loam, strong brown (7.5YR 4/6) moist; moderate medium and coarse angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; few very fine and fine roots; many very fine interstitial pores and common fine and medium tubular pores; many thick clay films on peds and in pores; 30 percent shot 2 to 5

millimeters in diameter and 10 percent pebbles 2 to 20 millimeters in diameter; medium acid; gradual wavy boundary.

B22t—39 to 63 inches; variegated dark red (2.5YR 3/6), strong brown (7.5YR 5/8), and reddish yellow (7.5YR 7/6) very gravelly clay, strong brown (7.5YR 4/6) moist; massive; hard, friable, sticky and plastic; moderately smeary; few very fine and fine roots; many very fine interstitial pores and common fine and few medium tubular pores; common thick clay films in pores; 25 percent shot 2 to 5 millimeters in diameter and 10 percent pebbles 2 to 50 millimeters in diameter; strongly acid.

Thickness of the solum and depth of the soil are 60 to 80 inches. The mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 17 and 44 inches is dry in all parts from June 1 to October 15 and is moist in all parts from January 1 to March 30. Base saturation (sum of cations) is 50 to 75 percent throughout the profile. Mineralogy is influenced by the presence of amorphous material. Reaction is slightly acid to strongly acid.

The A horizon has color of 10YR 4/2, 5/2, 6/2, 7/2, or 7/3. Moist color is 10YR 2/2, 3/2, 3/3, 4/3, or 5/4. There is commonly a surface erosion pavement that has about 90 percent angular obsidian fragments.

The B2t horizon has color of 7.5YR 5/8, 6/2, 6/4, 7/6, or 7/7 or of 2.5YR 3/6. Moist color is 7.5YR 4/3, 4/6, or 5/6 or 10YR 5/4 or 5/6. Chroma of more than 4 occurs in the lower part of the B2t horizon. The horizon is very gravelly sandy clay loam, very gravelly clay loam, or very gravelly clay. The particle-size control section is 25 to 35 percent clay and 35 to 50 percent pebbles. The lower part of the B2t horizon commonly has 35 to 45 percent clay.

Bressa Series

The Bressa series consists of moderately deep, well drained soils on hills. These soil formed in material weathered from sandstone. Slope is 8 to 50 percent.

Soils of the Bressa series are fine-loamy, mixed, thermic Typic Haploxeralfs.

Typical pedon of a Bressa loam in an area of Maymen-Millsholm-Bressa complex, 30 to 50 percent slopes, about 200 feet north and 300 feet east of the intersection of Bachelor Valley Road and State Highway 20; 800 feet north and 2,350 feet east of the southwest corner of sec. 2, T. 15 N., R. 10 W., Upper Lake quadrangle.

A1—0 to 3 inches; light brownish gray (10YR 6/2) loam, dark grayish brown (10YR 4/2) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine tubular and interstitial pores; medium acid; abrupt wavy boundary.

A3—3 to 12 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; slightly hard, firm, slightly sticky and slightly plastic; many very fine and few medium roots; many very fine and common fine and medium tubular and interstitial pores; slightly acid; clear wavy boundary.

B2t—12 to 22 inches; light yellowish brown (10YR 6/4) clay loam, yellowish brown (10YR 5/4) moist; weak medium and coarse prismatic structure parting to moderate medium and coarse angular blocky; hard, firm, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine and common fine and medium tubular pores and common very fine and fine interstitial pores; few thin clay films on peds and in pores; 8 percent pebbles 2 to 50 millimeters in diameter; medium acid; clear wavy boundary.

B3t—22 to 26 inches; light yellowish brown (10YR 6/4) clay loam, dark yellowish brown (10YR 4/4) moist; massive; hard, friable, sticky and plastic; common very fine roots and few fine and medium roots; common very fine tubular pores; many moderately thick clay films on peds and in pores; 10 percent pebbles 2 to 25 millimeters in diameter; medium acid; abrupt wavy boundary.

R—26 inches; fractured sandstone; fractures are 2 to 10 millimeters wide and 10 to 50 millimeters apart; roots extend down into fractures.

Thickness of solum and depth to lithic contact are 20 to 40 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 4 and 12 inches is dry from June 15 to October 15 and is moist from December 1 to April 15. Pebbles commonly make up 0 to 15 percent of the soil volume. Base saturation (sum of cations) is 75 to 90 percent throughout the profile. Reaction is medium acid to neutral throughout the profile.

The A horizon has color of 7.5YR 6/3 or 6/4 or of 10YR 6/2, 6/3, or 6/4. Moist color is 7.5YR 3/4 or 4/4 or 10YR 3/4, 4/2, 4/3, 4/4, or 5/3.

The B2t horizon has color of 7.5YR 6/4 or 6/6 or of 10YR 5/4, 6/3, 6/4, or 6/6. Moist color is 7.5YR 5/4 or 5/6 or 10YR 5/4. The horizon is clay loam that is 27 to 35 percent clay. Some pedons have 15 to 35 percent pebbles in the lower part of the B2t or B3t horizon.

Bressa soils in this survey area commonly have lithic contact and have redder colors in the A horizon, which are not defined in the range for the series. These differences, however, do not significantly affect their use and management.

Clear Lake Series

The Clear Lake series consists of very deep, poorly drained soils in basins. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Clear Lake series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Clear Lake clay, 2,000 feet north of Big Valley Road, at a point 1,900 feet west of its intersection with Brown Drive; 800 feet south and 1,200 feet east of the northwest corner of sec. 10, T. 13 N., R. 9 W., Kelseyville quadrangle.

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate very fine, fine, and medium granular structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; many very fine and fine interstitial pores; mildly alkaline; abrupt smooth boundary.

A12ca—6 to 28 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium and coarse prismatic structure; very hard, firm, very sticky and very plastic; common very fine, fine, and medium roots and few coarse roots; common very fine and few fine interstitial pores; violently effervescent; few medium soft masses of lime; common slickensides; moderately alkaline; clear smooth boundary.

A13—28 to 41 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium and coarse prismatic structure; very hard, firm, very sticky and very plastic; common very fine and fine roots; common very fine tubular pores and few fine interstitial pores; violently effervescent; few medium soft masses of lime; common slickensides; moderately alkaline; gradual smooth boundary.

C1ca—41 to 56 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak medium and coarse prismatic structure; very hard, firm, sticky and plastic; few very fine and fine roots; common very fine and fine tubular pores and few fine interstitial pores; violently effervescent; few medium soft masses of lime; common slickensides; moderately alkaline; gradual smooth boundary.

C2ca—56 to 72 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak coarse subangular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine and fine tubular and interstitial pores; violently effervescent; few medium soft masses of lime; moderately alkaline.

Thickness of the solum is 25 to 45 inches. Mean annual soil temperature is 59 to 62 degrees F. Cracks open and close once a year. Vertical cracks are 50 to 100 centimeters deep and 2 to 10 centimeters wide and are fully open from July 15 to September 30 and are fully closed from January 1 to April 15. Slickensides are few to common below the Ap horizon. Some pedons have gilgai microrelief. Reaction is mildly alkaline or moderately alkaline throughout. Depth to free carbonates is 6 to 28 inches. Depth to a seasonal high water table is 36 to 60 inches in winter and spring. The water table drops below a depth of 60 inches during the growing season. The soils formed under poorly drained conditions; however, drainage has been altered because of entrenchment of stream channels.

The A horizon has color of 10YR 3/1 or 4/1 or of 2.5Y 3/1. Moist color is 10YR 2/1 or 3/1 or N 2/0 or 3/0. The horizon is 40 to 60 percent clay.

The C horizon has color of 10YR or 2.5Y 4/2, 5/2, 6/2, or 6/3. Moist color is 10YR 2/1, 3/1, 4/2, 5/2, or 5/3; 2.5Y 3/2 or 4/2; or 5Y 4/2. Some pedons are mottled. The horizon is 35 to 60 percent clay.

Clear Lake Variant

The Clear Lake Variant consists of very deep, poorly drained soils in basins. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Clear Lake Variant are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Clear Lake Variant clay, 150 feet south and 850 feet west of the intersection of Matthews Road and Highland Springs Road; 150 feet south and 850 feet west of the northeast corner of sec. 7, T. 13 N., R. 9 N., Highland Springs quadrangle.

A11—0 to 7 inches; very dark gray (10YR 3/1) clay, black (N 2/0) moist; few fine prominent strong brown (7.5YR 5/8) mottles, strong brown (7.5YR 4/6) moist; moderate medium and very coarse subangular blocky structure; very hard, firm, sticky and plastic; many very fine and few fine roots; few very fine tubular pores; slightly acid; clear wavy boundary.

A12—7 to 30 inches; dark gray (N 4/0) clay, very dark gray (N 3/0) moist; common fine and medium prominent yellowish brown (10YR 5/6) mottles, dark reddish brown (5YR 3/3) moist; strong coarse and very coarse prismatic structure parting to weak medium and coarse subangular blocky; very hard, firm, sticky and plastic; many very fine roots; many very fine tubular pores; few pressure faces on peds; neutral; abrupt irregular boundary.

A13—30 to 38 inches; light gray (10YR 6/1) clay, dark gray (N 4/0) moist; many large prominent strong brown (7.5YR 5/6) mottles, dark reddish brown (2.5YR 3/4) moist; strong coarse and very coarse prismatic structure parting to weak fine, medium, and coarse subangular blocky; very hard, firm, sticky and plastic; common very fine roots; many very fine tubular pores; few pressure faces on peds; neutral; abrupt irregular boundary.

C1—38 to 55 inches; dark gray (10YR 4/1) clay, very dark gray (N 3/0) moist; few fine prominent yellowish red (5YR 5/8) mottles, dark reddish brown (2.5YR 3/4) moist; moderate medium, coarse, and very coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; few pressure faces on peds; 1 percent soft rock fragments; slightly acid; clear wavy boundary.

C2—55 to 63 inches; light gray (5Y 6/1) clay, olive gray (5Y 4/2) moist; few fine prominent yellowish red (5YR 5/8) mottles, red (2.5YR 4/6) moist; moderate medium and coarse prismatic structure; many very fine tubular pores; 1 percent soft rock fragments; slightly acid; abrupt wavy boundary.

C3—63 to 72 inches; pale olive (5Y 6/3) clay loam, variegated yellowish brown (10YR 5/4) and gray (5Y 5/1) moist; few fine prominent strong brown (7.5YR 5/8) mottles, red (2.5YR 4/6) moist; massive; hard, friable, sticky and plastic; few very fine roots; common very fine and fine tubular pores and many very fine interstitial pores; 10 percent pebbles 2 to 25 millimeters in diameter; medium acid.

Thickness of the solum is 20 to 40 inches. The profile is more than 60 inches deep. The mean annual soil temperature is 59 to 62 degrees F. Cracks open and close once a year. Vertical cracks are 50 to 100 centimeters deep and 2 to 10 centimeters wide and are fully open from July 15 to September 30 and fully closed from January 1 to April 15. Slickensides are few to common. Some pedons have gilgai microrelief. Reaction is medium acid to neutral throughout. Depth to a seasonal high water is 36 to 60 inches in winter and spring. The water table drops below a depth of 60 inches during the growing season. The soils formed under poorly drained conditions; however, drainage has been altered by the entrenchment of stream channels.

The A horizon has color of 10YR 3/1, 4/1, 5/1, or 6/1 or of N 2/0, 3/0, or 4/0. Moist color is 10YR 2/1 or 3/1 or N 2/0, 3/0, or 4/0. The horizon has 40 to 60 percent clay.

The C horizon has color of 10YR or 2.5Y 4/1, 4/2, 5/2, 6/2, or 6/3 or of 5Y 6/1 or 6/3. Moist color is 10YR 3/1, 3/2, 4/2, or 5/4. Distinct mottling usually is present. The horizon has 35 to 60 percent clay.

Cole Series

The Cole series consists of very deep, somewhat poorly drained soils in basins and on flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Cole series are fine, mixed, thermic Pachic Argixerolls.

Typical pedon of Cole clay loam, 75 feet northwest of the junction of Argonaut Road and Thomas Drive; 1,300 feet south and 30 feet west of the northeast corner of sec. 8, T. 13 N., R. 9 W., Kelseyville quadrangle.

Ap—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure parting to strong fine and medium granular; hard, firm, sticky and plastic; common very fine, fine, and medium roots; common fine and medium tubular pores; few worm casts; slightly acid; abrupt smooth boundary.

B1t—6 to 13 inches; grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure parting to strong fine and medium granular; hard, firm, sticky and plastic; common very fine, fine, and medium roots; many fine and medium tubular pores; common thin clay films on peds and in pores; few worm casts; slightly acid; clear smooth boundary.

B21t—13 to 35 inches; gray (10YR 5/1) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse angular blocky structure; very hard, firm, sticky and plastic; common very fine, fine, and medium roots; common very fine and fine and few medium tubular pores; many thin and common moderately thick clay films on peds and in pores; 2 percent pebbles 5 to 15 millimeters in diameter; moderately alkaline; clear wavy boundary.

B22t—35 to 51 inches; variegated pale brown (10YR 6/3) and grayish brown (10YR 5/2) clay loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure; hard, firm, sticky and plastic; common medium and coarse roots and few fine roots; common very fine and fine and few medium tubular pores; many thin clay films bridging mineral grains and common moderately thick clay films on peds and in pores; moderately alkaline; clear wavy boundary.

B3t—51 to 62 inches; variegated brown (10YR 5/3) and pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure; hard, firm, sticky and plastic; common medium and coarse roots and few fine roots; many very fine and fine and common medium tubular pores; few thin and moderately thick clay films bridging mineral grains, on peds, and in pores; moderately alkaline; clear smooth boundary.

C—62 to 71 inches; variegated brown (10YR 5/3) and pale brown (10YR 6/3) clay loam, yellowish brown (10YR 5/4) moist; weak medium prismatic structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine and fine and few medium tubular pores; common thin clay films on peds, bridging mineral grains, and in pores; 4 percent pebbles 2 to 20 millimeters in diameter; moderately alkaline.

Thickness of the solum is 45 to 70 inches. Depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 4 and 12 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. The particle-size control section is 35 to 45 percent clay. Organic carbon content is 1 to 2 percent at a depth of 20 to 35 inches.

The A horizon has color of 10YR 4/1, 4/2, 5/1, or 5/2 or of 2.5Y 4/2 or 5/2. Moist color is 10YR 2/1, 2/2, 3/1, or 3/2 or 2.5Y 3/2. Reaction is medium acid to neutral.

The B2t horizon has color of 10YR 3/1, 3/2, 4/1, 4/2, 5/1, or 5/2 or of 2.5Y 3/2, 4/2, or 5/2. Moist color is 10YR 3/1 or 3/2 or 2.5Y 3/2. In some pedons, the lower part of the B2t horizon has color of 10YR 6/2, 6/3, 6/4, or 6/6 when dry and 10YR 4/4, 5/3, or 5/4 when moist. Mottles are in some pedons. The horizon is silty clay loam, heavy clay loam, silty clay, or clay. Reaction is slightly acid to moderately alkaline. Some pedons do not have a B1t or B3t horizon.

The C horizon has color of 10YR 4/3, 5/2, 5/3, 6/2, or 6/3; of 2.5Y 5/2 or 6/2; or of 5Y 5/2, 5/3, or 6/2. Moist color is 10YR 4/2, 4/3, 5/3, 5/4 or 6/2 or 2.5Y 4/2. Reaction is mildly alkaline or moderately alkaline, and the soil is noncalcareous.

Cole Variant

The Cole Variant consists of very deep, moderately well drained soils on flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Cole Variant are fine, mixed, thermic Cumulic Haploxerolls.

Typical pedon of Cole Variant clay loam, 475 feet west of State Highway 20 at a point 1,600 feet southeast of its intersection with Reclamation Cutoff; 2,600 feet south and 3,800 feet east of the northwest corner of sec. 20, T. 15 N., R. 9 W., Upper Lake quadrangle.

Ap—0 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/1) moist; moderate coarse and very coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine, fine, and medium roots; few fine tubular and interstitial pores; moderately alkaline; clear wavy boundary.

AC—8 to 24 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; moderate medium coarse and very coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine, fine, and medium roots; few very fine tubular and interstitial pores; moderately alkaline; gradual wavy boundary.

C1—24 to 43 inches; dark gray (10YR 4/1) clay, black (10YR 2/1) moist; weak medium, coarse, and very coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine and fine roots; few very fine tubular and interstitial pores; moderately alkaline; gradual wavy boundary.

C2—43 to 60 inches; grayish brown (10YR 5/2) clay, black (10YR 2/1) moist; weak medium, coarse, and very coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; moderately alkaline.

Thickness of the solum is 20 to 30 inches. The profile is more than 60 inches deep. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 5 and 18 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 15. The particle-size control section is 35 to 50 percent clay. Organic matter content is 1 to 2 percent throughout the upper 30 inches and decreases irregularly with increasing depth. Reaction is slightly acid to moderately alkaline throughout profile. Some pedons have a calcareous substratum at a depth of 20 to 50 inches.

The A horizon has color of 10YR 4/1, 4/2, or 5/2. Moist color is 10YR 2/1, 3/1, or 3/2. The horizon is silt loam or clay loam that is 20 to 40 percent clay. Some pedons do not have an AC horizon. The A horizon is 20 to 30 inches thick.

The C horizon has color of 10YR 4/1, 4/2, 5/1, 5/2, or 5/3. Moist color is 10YR 2/1, 3/1, 3/2, 3/3, or 3/4. The horizon is clay loam or clay. Clay increase occurs over a great distance or is not sufficient to qualify as an argillic horizon.

Collayomi Series

The Collayomi series consists of very deep, well drained soils on hills and mountains. These soils formed in material weathered from andesite, basalt, or dacite. Slope is 5 to 75 percent.

Soils of the Collayomi series are loamy-skeletal, mixed, mesic Ultic Haploxeralfs.

Typical pedon of a Collayomi very gravelly loam in an area of Collayomi-Aiken-Whispering complex, 30 to 50 percent slopes, about 5 feet north of a dirt road, 0.3 mile southeast of its intersection with Observation Road; 1,500 feet south and 1,500 feet west of the northeast corner of sec. 26, T. 12 N., R. 8 W., Whispering Pines quadrangle.

A1—0 to 9 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; strong fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine and common medium interstitial pores; 40 percent pebbles 2 to 75 millimeters in diameter, 5 percent cobbles 75 to 250 millimeters in diameter, and 1 percent stones 250 to 600 millimeters in diameter; neutral; clear wavy boundary.

A3—9 to 15 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; strong fine and medium subangular blocky structure parting to moderate very fine granular; slightly hard, very friable, sticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and common fine interstitial pores and common fine tubular pores; 40 percent pebbles 2 to 75 millimeters in diameter, 5 percent cobbles 75 to 250 millimeters in diameter, and 1 percent stones 250 to 600 millimeters in diameter; neutral; clear wavy boundary.

B21t—15 to 30 inches; light brown (7.5YR 6/4) very gravelly loam, brown (7.5YR 4/4) moist; moderate medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; weakly smeary; many very fine and fine interstitial pores and common fine tubular pores; many thin and common moderately thick clay films on peds, in pores, and bridging sand grains; 40 percent pebbles 2 to 75 millimeters in diameter, 5 percent cobbles 75 to 250 millimeters in diameter, and 1 percent stones 250 to 600 millimeters in diameter; neutral; clear smooth boundary.

B22t—30 to 50 inches; reddish yellow (5YR 6/6) very gravelly loam, yellowish red (5YR 4/6) moist; moderate fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; moderately smeary; few fine, medium, and coarse roots; many very fine interstitial pores and few fine tubular pores; many thin and common moderately thick clay films on peds, in pores, and bridging sand grains; 35 percent pebbles 2 to 75 millimeters in diameter, 5 percent cobbles 75 to 250 millimeters in diameter, and 1 percent stones 250 to 600 millimeters in diameter; neutral; gradual smooth boundary.

B3t—50 to 60 inches; light brown (5YR 6/4) extremely gravelly loam, reddish brown (5YR 4/4) moist; moderate medium and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; weakly smeary; few very fine roots; many very fine, fine, and medium interstitial pores; many moderately thick clay films on peds, in pores, and bridging sand grains; 60 percent pebbles 2 to 75 millimeters in diameter, 5 percent cobbles 75 to 250 millimeters in diameter, and 1 percent stones 250 to 600 millimeters in diameter; neutral.

Thickness of the solum and depth of the profile are 60 to 80 inches. The mean annual soil temperature is 51 to 56 degrees F. The part of the profile between depths of 18 and 54 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 15. The particle-size control section commonly is 20 to 30 percent clay but is as much as 35 percent clay and has 35 to 60 percent rock fragments. The surface is nonstony or stony; stones and boulders, where present, are 10 inches to 8 feet in diameter. Base saturation (sum of cations) is 50 to 60 percent.

The A horizon has color of 5YR 6/3 or 6/4 or of 7.5YR 6/2 or 6/4. Moist color is 5YR 4/4 or 4/7 or 7.5YR 4/4. The horizon is very gravelly loam or stony loam. It is neutral to medium acid.

The B2t horizon has color of 5YR 6/4 or 6/6 or of 7.5YR 6/4 or 6/6. Moist color is 5YR 4/6 or 7.5YR 4/4. The horizon is very gravelly loam, very gravelly clay loam, very cobbly loam, very cobbly clay loam, very stony loam, or very stony clay loam. Clay content decreases in the lower part of the B2t or B3t horizon by 1.2 times to 1.5 times its maximum within a depth of 60 inches. The B horizon is neutral or slightly acid.

Deadwood Series

The Deadwood series consists of shallow, somewhat excessively drained soils on mountains. These soils formed in material weathered from sandstone. Slope is 30 to 75 percent.

Soils of the Deadwood series are loamy-skeletal, mixed, mesic Dystric Lithic Xerochrepts.

Typical pedon of a Deadwood very gravelly sandy loam in an area of Neuns-Sanhedrin-Deadwood complex, 50 to 75 percent slopes, in Mendocino National Forest; 2,950 feet south and 700 feet east of the southwest corner of sec. 34, T. 17 N., R. 9 W. (area south of sec. 34 is not sectionalized), Potato Hill quadrangle.

O1—1 inch to 0; pine needles, oak leaves, and twigs.

A1—0 to 4 inches; brown (10YR 5/3) very gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; weak very fine granular structure; soft, very friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine and fine interstitial pores; 50 percent pebbles 2 to 50 millimeters in diameter; medium acid; clear smooth boundary.

B1—4 to 9 inches; light yellowish brown (10YR 6/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and many medium roots; many very fine and fine and few medium interstitial pores; 55 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 125 millimeters in diameter; strongly acid; clear wavy boundary.

B2—9 to 13 inches; brownish yellow (10YR 6/6) extremely gravelly sandy loam, dark yellowish brown (10YR 4/6) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine, fine, and coarse roots and many medium roots; many very fine and fine and few medium interstitial

pores; 65 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 125 millimeters in diameter; strongly acid; abrupt wavy boundary.

R—13 inches; hard, fractured sandstone; fractures are 1 to 5 millimeters wide and 25 to 150 millimeters apart; few fine and medium roots in fractures.

Depth to lithic contact is 10 to 20 inches. The mean annual soil temperature is 47 to 53 degrees F. The part of the profile between depths of 4 and 12 inches is dry in all parts from June 15 to October 15 and is moist in most parts from December 1 to April 30. The particle-size control section averages 10 to 20 percent clay and 40 to 75 percent rock fragments consisting of pebbles and cobbles. Base saturation is 35 to 60 percent throughout.

The A horizon has color of 10YR 5/3, 6/3, or 6/4. Moist color is 10YR 3/3, 3/4, or 4/4. The horizon is slightly acid to strongly acid.

The B2 horizon has color of 10YR 6/3, 6/4, or 6/6. Moist color is 10YR 4/3, 4/4, or 4/6. The horizon has weak or moderate subangular blocky structure. It is sandy loam or loam and is very gravelly or extremely gravelly.

Decy Series

The Decy series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from sandstone and shale. Slope is 30 to 50 percent.

Soils of the Decy series are loamy-skeletal, mixed, mesic Typic Xerumbrepts.

Typical pedon of Decy gravelly sandy loam in an area of Neuns-Decy-Sanhedrin complex, 30 to 50 percent slopes, in Mendocino National Forest; 0.2 mile north of the intersection with road 19N19 on road 1N02 and then upslope 60 yards; 350 feet south and 2,100 feet west of the northeast corner of sec. 23, T. 19 N., R. 10 W., Lake Pillsbury quadrangle.

O1—1 inch to 0; decomposed and partially decomposed conifer litter consisting of needles, twigs, and cones.

A11—0 to 2 inches; brown (10YR 4/3) gravelly sandy loam, very dark brown (10YR 2/2) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; few very fine roots; common very fine and fine interstitial pores; 15 percent pebbles 2 to 30 millimeters in diameter; very strongly acid; abrupt smooth boundary.

A12—2 to 8 inches; brown (10YR 4/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate very fine, fine, and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine, and medium roots; many very fine and fine and common medium interstitial pores; 20 percent pebbles 2 to 40 millimeters in diameter; very strongly acid; clear wavy boundary.

B21—8 to 15 inches; brown (10YR 5/3) gravelly sandy loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots, many medium roots, and common coarse roots; many very fine and fine interstitial pores; few thin silt coatings on peds; 30 percent pebbles 2 to 50 millimeters in diameter; very strongly acid; clear wavy boundary.

B22—15 to 24 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine roots and common medium and coarse roots; common very fine and fine interstitial pores; common thin silt coatings on peds and in pores; 35 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 125 millimeters in diameter; very strongly acid; abrupt wavy boundary.

R—24 inches; hard, fractured sandstone and interbedded shale; fractures are 0 to 10 millimeters wide and 10 to 30 millimeters apart; few fine roots in fractures.

Thickness of the solum and depth to the lithic contact are 20 to 40 inches. The mean annual soil temperature is 50 to 55 degrees F. The part of the profile between depths of 9 and 24 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to May 15. The particle-size control section averages 10 to 25 percent clay and 35 to 55 percent rock fragments consisting of pebbles and cobbles. Base saturation (sum of cations) is 25 to 40 percent throughout. Reaction is medium acid to very strongly acid.

The A horizon has color of 10YR 4/3 or 4/4. Moist color is 10YR 2/2, 3/2, or 3/3.

The B2t horizon has color of 10YR 5/3 or 5/4. Moist color is 10YR 3/3, 3/4, 4/3, or 4/4. The horizon is sandy clay loam, sandy loam, or loam and is gravelly or very gravelly.

Dubakella Series

The Dubakella series consists of moderately deep, well drained soils on hills and mountains. These soils formed in material weathered from serpentinite and peridotite. Slope is 15 to 50 percent.

Soils of the Dubakella series are clayey-skeletal, serpentinitic, mesic Mollic Haploxeralfs.

Typical pedon of a Dubakella very gravelly loam in an area of Okiota-Henneke-Dubakella association, 15 to 50 percent slopes, 400 feet west of State Highway 29, at a point about 1 mile north of the Lake County-Napa County line; 1,400 feet south and 600 feet west of the

northeast corner of sec. 26, T. 10 N., R. 7 W., Detert Reservoir quadrangle.

O1—2 inches to 0; decomposing litter of manzanita leaves, pine needles, and grass; 10 percent pebbles occurring as an erosion pavement.

A1—0 to 7 inches; dark reddish brown (5YR 3/4) very gravelly loam, dark reddish brown (5YR 3/3) moist; weak fine and medium granular structure; slightly hard, friable, slightly sticky and nonplastic; many fine and medium and few coarse interstitial pores; 40 percent pebbles 2 to 75 millimeters in diameter; neutral; clear wavy boundary.

B21t—7 to 13 inches; reddish brown (5YR 4/4) very gravelly clay loam, dark reddish brown (5YR 3/4) moist; moderate very fine and fine subangular blocky structure parting to weak fine granular; hard, firm, sticky and plastic; common fine and medium roots and few coarse roots; common fine and medium interstitial pores; few thin clay films on peds; 45 percent pebbles 2 to 75 millimeters in diameter; neutral; gradual wavy boundary.

B22t—13 to 30 inches; reddish brown (5YR 4/4) very gravelly clay, dark reddish brown (5YR 3/4) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common fine roots and few medium and coarse roots; common fine and medium interstitial pores; few thin clay films on peds; 55 percent pebbles 2 to 75 millimeters in diameter; neutral; abrupt irregular boundary.

R—30 inches; hard, fractured serpentinite and peridotite with veins of asbestos 1 to 8 millimeters wide; fractures are 6 millimeters wide and as much as 250 millimeters apart.

Thickness of the solum and depth to the lithic contact are 20 to 40 inches. The mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 7 and 27 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. The particle-size control section averages 35 to 50 percent clay and 35 to 60 percent rock fragments consisting of pebbles, cobbles, and stones. The calcium to magnesium ratio is 1:1 to 1:10.

The A horizon has color of 5YR 3/3 or 3/4. Moist color is 5YR 3/2 or 3/3. The horizon is 4 to 10 inches thick. Organic matter content is 0.5 to 1.0 percent below a depth of 7 inches. The horizon is neutral or slightly acid.

The B2t horizon is 5YR 3/4 or 4/4. Moist color is 5YR 3/3 or 3/4. The horizon is very gravelly clay loam, very gravelly clay, or very cobbly clay that is 30 to 50 percent clay. Base saturation (sum of cations) is 75 to 95 percent. The horizon is slightly acid to mildly alkaline.

Etsel Series

The Etsel series consists of shallow, somewhat excessively drained soils on hills and mountains. These soils formed in material weathered from sandstone or shale. Slope is 15 to 80 percent.

Soils of the Etsel series are loamy-skeletal, mixed, nonacid, mesic Lithic Xerorthents.

Typical pedon of an Etsel gravelly loam in an area of Maymen-Etsel-Speaker association, 30 to 50 percent slopes, in Mendocino National Forest on Pitney Ridge Road, south side of the road; 3,200 feet north and 300 feet east of the southwest corner of sec. 13, T. 16 N., R. 10 W., Upper Lake quadrangle.

A11—0 to 3 inches; very pale brown (10YR 7/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure parting to strong fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores and common fine tubular pores; 15 percent pebbles 2 to 75 millimeters in diameter and 7 percent cobbles 75 to 150 millimeters in diameter; medium acid; clear smooth boundary.

A12—3 to 10 inches; very pale brown (10YR 7/4) very gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure parting to moderate fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; common very fine interstitial pores and common fine tubular pores; 35 percent pebbles 2 to 75 millimeters in diameter and 7 percent cobbles 75 to 150 millimeters in diameter; strongly acid; abrupt irregular boundary.

R—10 inches; hard, fractured sandstone; fractures are 25 to 100 millimeters apart and as much as 2 millimeters wide and contain soil material.

Depth to lithic contact is 6 to 12 inches. Mean annual soil temperature is 55 to 58 degrees F. The soils are dry in all parts from June 1 to October 15 and are moist in all parts from December 1 to April 30. Rock fragment content averages 35 to 55 percent of the particle-size control section but ranges from 20 to 65 percent. Reaction is slightly acid to strongly acid throughout the profile.

The A horizon has color of 7.5YR or 10YR 5/4, 6/3, 6/4, or 7/4. Moist color is 7.5YR or 10YR 3/4, 4/3, or 4/4. The horizon is gravelly loam or gravelly sandy loam in the upper part and very gravelly loam or very gravelly sandy loam in the lower part.

Fluvaquentic Haplaquolls

Fluvaquentic Haplaquolls are very poorly drained soils on lake marshes. These soils formed in lacustrine deposits weathered from mixed sources. Slope is 0 to 2 percent.

Reference pedon of Fluvaquentic Haplaquolls, nearly level, about 2,600 feet north of the north end of Blower Road; 500 feet north and 1,650 feet west of the southeast corner of sec. 28, T. 14 N., R. 9 W., Lucerne quadrangle.

A11—0 to 2 inches; grayish brown (2.5Y 5/2) silty clay loam, dark olive gray (5Y 3/2) moist; common medium distinct brownish yellow (10YR 6/8) mottles, brownish yellow (10YR 6/6) moist; weak coarse subangular blocky structure; hard, firm, sticky and plastic; many very fine, fine, medium, and coarse roots; common very fine and few fine tubular and interstitial pores; neutral; abrupt wavy boundary.

A12—2 to 5 inches; grayish brown (2.5Y 5/2) loam, dark olive gray (5Y 3/2) moist; common medium distinct brownish yellow (10YR 6/8) mottles, brownish yellow (10YR 6/6) moist; weak coarse subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; many very fine, fine, medium, and coarse roots; common very fine and few fine tubular and interstitial pores; neutral; abrupt wavy boundary.

IIC1—5 to 9 inches; light yellowish brown (10YR 6/4) gravelly loamy coarse sand, dark yellowish brown (10YR 4/4) moist; common medium distinct brownish yellow (10YR 6/8) mottles, brownish yellow (10YR 6/6) moist; single grain; very friable, nonsticky and nonplastic; many very fine, fine, medium, and coarse roots; many very fine, fine, and medium interstitial pores; 30 percent pebbles 2 to 12 millimeters in diameter; neutral; abrupt wavy boundary.

IIIC2—9 to 20 inches; olive gray (5Y 4/2) silty clay loam, black (5Y 2/2) moist; common medium faint very pale brown (10YR 7/4) mottles, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots and few medium roots; common very fine and few fine tubular and interstitial pores; black (10YR 2/1) organic stains on peds; moderately alkaline; abrupt wavy boundary.

IVC3—20 to 30 inches; grayish brown (2.5Y 5/2) sand, dark grayish brown (2.5Y 4/2) moist; common large distinct reddish yellow (5Y 6/8) mottles, dark reddish brown (5YR 3/3) moist; single grain; soft, very friable, nonsticky and nonplastic; many very fine and fine interstitial pores; mildly alkaline; abrupt wavy boundary.

VC4—30 to 60 inches; light olive gray (5Y 6/2) silt loam, dark gray (5Y 4/1) moist; common large faint strong brown (7.5YR 5/6) mottles, dark brown (7.5YR 3/4) moist; weak fine and medium angular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine interstitial pores; moderately alkaline.

The profile is more than 60 inches deep. A water table fluctuates between depths of 1 foot above the surface and 3 feet below the surface throughout the year. Reaction is neutral to moderately alkaline throughout the profile.

These soils have hue of 10YR, 2.5Y, or 5Y and value and chroma to qualify them for a mollic epipedon. They are stratified silty clay loam, loam, silty clay, silt loam, sandy loam, loamy coarse sand, and sand. Thin gravelly layers are present in most pedons.

Forbesville Series

The Forbesville series consists of very deep, well drained soils on terraces. These soils formed in alluvium derived from mixed sources. Slope is 2 to 15 percent.

Soils of the Forbesville series are fine, mixed, thermic Ultic Palexeralfs.

Typical pedon of Forbesville loam, 5 to 15 percent slopes, about 250 feet south of Bell Hill Road, at a point about 0.6 mile southwest of its intersection with Plunkett Lane; 750 feet south and 1,150 feet east of the northwest corner of sec. 21, T. 13 N., R. 9 W., Kelseyville quadrangle.

Ap—0 to 6 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/4) moist; moderate fine granular structure; hard, friable, slightly sticky and slightly plastic; many very fine and common fine roots; common fine tubular pores and common very fine interstitial pores; 5 percent pebbles 2 to 20 millimeters in diameter; medium acid; abrupt smooth boundary.

B1—6 to 16 inches; yellowish red (5YR 5/6) loam, yellowish red (5YR 4/6) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and few fine roots; common very fine, fine, and medium tubular pores; worm casts present; slightly acid; abrupt smooth boundary.

B21t—16 to 30 inches; red (2.5YR 5/6) clay, red (2.5YR 4/6) moist; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and few fine roots; few very fine and fine tubular and interstitial pores; many moderately thick clay films on peds; 10 percent pebbles 2 to 30 millimeters in diameter; common fine black coatings on peds and pebbles; strongly acid; gradual wavy boundary.

B22t—30 to 46 inches; red (2.5YR 5/6) very gravelly clay, red (2.5YR 4/6) moist; moderate very fine and

fine subangular blocky structure; very hard, friable, sticky and plastic; few very fine tubular pores and common very fine interstitial pores; continuous thick clay films on peds and in pores; 35 percent pebbles 2 to 75 millimeters in diameter; strongly acid; clear wavy boundary.

B3t—46 to 70 inches; reddish yellow (7.5YR 6/6) very gravelly clay loam, strong brown (7.5YR 5/6) moist; weak moderate subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular and interstitial pores; common thick clay films as bridges and on peds; 40 percent weathered pebbles 2 to 75 millimeters in diameter; common fine black coatings on peds and pebbles; medium acid.

Thickness of the solum and depth of the profile are more than 60 inches. Mean annual temperature is 59 to 62 degrees F. The part of the profile between depths of 7 and 21 inches is dry in all parts from June 1 to October 15 and is moist in all parts from December 1 to April 15. Base saturation (sum of cations) is 50 to 75 percent throughout the profile.

The A horizon has color of 5YR, 7.5YR, or 10YR 4/4, 5/4, or 5/6. Moist color is 5YR or 10YR 3/3, 3/4, 4/3, or 4/4 or 7.5YR 3/4 or 4/4. Moist value and chroma of 3.5 or less occur only in the upper 6 inches. The horizon is strongly acid or slightly acid.

The B2t horizon has color of 2.5YR, 5YR, or 7.5YR 5/4, 5/6, or 6/6. Moist color is 2.5YR, 5YR, or 7.5YR 4/4, 4/6, or 5/6. The horizon is clay loam, clay, gravelly clay loam, gravelly clay, very gravelly clay loam, or very gravelly clay. It is strongly acid or medium acid. The upper 20 inches of the argillic horizon averages 35 to 55 percent clay and 0 to 40 percent pebbles.

Forward Series

The Forward series consists of moderately deep, well drained soils on hills and mountains. These soils formed in material weathered from rhyolitic tuff. Slope is 5 to 50 percent.

Soils of the Forward series are medial, mesic Typic Vitrandepts.

Typical pedon of a Forward loam in an area of Kidd-Forward complex, 30 to 50 percent slopes, 2,000 feet north and 1,800 feet east of the southwest corner of sec. 21, T. 10 W., R. 6 W., Detert Reservoir quadrangle.

O1—1 inch to 0; oak leaves, twigs, and pine needles.

A1—0 to 9 inches; light gray (10YR 7/1) loam, grayish brown (10YR 5/2) moist; moderate fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and few medium roots; many very fine and fine interstitial pores; 10 percent pebbles 2 to 10 millimeters in diameter; slightly acid; gradual wavy boundary.

B21—9 to 15 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; weakly smeary; few thin silt coatings on peds; common medium interstitial pores; 20 percent rounded pebbles 2 to 10 millimeters in diameter; medium acid; gradual wavy boundary.

B22—15 to 25 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; weakly smeary; common fine and medium roots and few coarse roots; many very fine and common medium interstitial pores; 25 percent rounded pebbles 2 to 10 millimeters in diameter; medium acid; clear wavy boundary.

Cr—25 to 30 inches; weathered rhyolitic tuff; fractures are less than 2 millimeters wide and contain no soil material; few medium and coarse roots penetrate fractures.

Depth to a paralithic contact is 20 to 40 inches. The mean annual soil temperature is 53 to 57 degrees F. The part of the profile between depths of 10 inches and bedrock is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. The solum contains 60 to 80 percent vitric material in the silt, sand, and gravel fractions. Rock fragment content of the profile is 5 to 35 percent. Mineralogy is dominated by amorphous material.

The A horizon has color of 10YR 5/2, 6/2, 7/2, or 7/2. Moist color is 10YR 4/4, 5/2, 5/3, or 5/4. The horizon is loam that is 10 to 18 percent clay.

The B2 horizon has color of 10YR 5/3, 6/2, 6/3, 7/2, or 7/3. Moist color is 10YR 4/4, 5/2, 5/3, or 5/4. The horizon is gravelly loam that is 10 to 18 percent clay. Reaction is slightly acid or medium acid.

Forward Variant

The Forward Variant consists of very deep, well drained soils on mountains. These soils formed in material weathered from rhyolitic tuff. Slope is 30 to 75 percent.

Soils of the Forward Variant are medial-skeletal, mesic Typic Vitrandepts.

Typical pedon of a Forward Variant very gravelly loam in an area of Forward Variant-Kidd association, 30 to 50 percent slopes, along an old mining road, about 300 feet southeast of Western Mine Road, at a point about 1,500 feet northeast of the Sonoma County and Lake County line; 900 feet north and 600 feet east of the southwest corner of sec. 16, T. 10 N., R. 7 W., Mount St. Helena quadrangle.

A1—0 to 7 inches; very pale brown (10YR 7/3) very gravelly loam, yellowish brown (10YR 5/6) moist; weak fine subangular blocky structure; loose, very friable, nonsticky and nonplastic; weakly smeary; common very fine and fine roots and few medium, coarse, and very coarse roots; many fine and medium interstitial pores and few medium and coarse tubular pores; 40 percent pebbles 2 to 25 millimeters in diameter; medium acid; clear wavy boundary.

B1—7 to 22 inches; very pale brown (10YR 7/4) very gravelly loam, light yellowish brown (10YR 6/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; weakly smeary; common very fine, fine, and medium roots and few coarse roots; common fine and medium interstitial pores and few fine and medium tubular pores; 40 percent pebbles 2 to 50 millimeters in diameter; medium acid; gradual wavy boundary.

B21—22 to 36 inches; very pale brown (10YR 7/4) very gravelly loam, yellowish brown (10YR 6/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; weakly smeary; common very fine, fine, medium, and coarse roots; common fine and medium interstitial pores and few fine and medium tubular pores; 40 percent pebbles 2 to 75 millimeters in diameter; medium acid; gradual wavy boundary.

B22—36 to 62 inches; light gray (10YR 7/2) very gravelly loam, pale brown (10YR 6/3) moist; weak fine subangular blocky structure; soft, very friable, slightly sticky and nonplastic; moderately smeary; common very fine and fine roots and few medium and coarse roots; common fine and medium interstitial pores and few fine and medium tubular pores; 35 percent pebbles 2 to 50 millimeters in diameter; medium acid; clear wavy boundary.

R—62 inches; fractured rhyolitic tuff; fractures are 150 to 600 millimeters apart and 5 to 25 millimeters wide; soil material is in fractures.

Thickness of the solum and depth to a lithic contact are 60 to 80 inches. The mean annual soil temperature is 53 to 57 degrees F. The part of the profile between depths of 10 and 40 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. Rock fragment content ranges from 35 to 50 percent throughout the profile; fragments consist of pebbles 2 to 75 millimeters in diameter. The solum contains 60 to 80 percent vitric material in the silt, sand, and gravel fractions. Mineralogy is dominated by amorphous material. Reaction is slightly acid or medium acid throughout the profile.

The A horizon has color of 10YR 6/2 or 7/3. Moist color is 10YR 4/2 or 5/6. It is very gravelly loam with 10 to 20 percent clay.

The B2 horizon has color of 10YR 7/2, 7/3, 7/4, 7/6, or 7/8. Moist color is 10YR 6/3 or 6/4. It is very gravelly loam with 10 to 20 percent clay. It has weak to moderate subangular blocky structure.

Freezeout Series

The Freezeout series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from metamorphosed sandstone. Slope is 30 to 75 percent.

Soils of the Freezeout series are loamy-skeletal, mixed, frigid Typic Xerumbrepts.

Typical pedon of Freezeout very gravelly sandy loam in an area of Freezeout-Yollabolly very gravelly sandy loams, 30 to 50 percent slopes, in Mendocino National Forest, about 800 feet east of the Lake County boundary in Colusa County, 450 feet downslope of Road 16N03, at a point about 0.5 mile south of its junction with the Horse Glade turnoff; 2,650 feet south and 100 feet west of the northeast corner of sec. 2, T. 16 N., R. 8 W., Fouts Spring quadrangle.

O1—1 inch to 0; decomposed and partially decomposed conifer litter consisting of twigs, bark, needles, and cones.

A1—0 to 5 inches; dark grayish brown (10YR 4/2) very gravelly sandy loam, very dark brown (10YR 2/2) moist; moderate medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium and coarse roots; many very fine and fine interstitial pores; 45 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 125 millimeters in diameter; medium acid; clear wavy boundary.

B1—5 to 16 inches; dark brown (10YR 4/3) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many fine roots, common medium roots, and few coarse roots; many very fine and fine interstitial pores; 30 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 125 millimeters in diameter; medium acid; gradual wavy boundary.

B2—16 to 25 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark brown (10YR 4/3) moist; weak fine subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; common very fine and fine roots; many very fine and fine interstitial pores; 40 percent pebbles 2 to 75 millimeters in diameter and 15 percent cobbles 75 to 125 millimeters in diameter; strongly acid; abrupt irregular boundary.

R—25 inches; hard, fractured metamorphosed sandstone; fractures are 5 to 25 millimeters wide and 25 to 125 millimeters apart; few fine roots in fractures.

Thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 44 to 47 degrees F. The part of the profile between depths of 12 and 25 inches is dry in all parts from July 25 to October 1 and is moist in all parts from December 15 to April 30. The particle-size control section is 10 to 18 percent clay. The umbric epipedon is 10 to 20 inches thick and has a base saturation (sum of cations) of 20 to 30 percent. Reaction of the solum is slightly acid to very strongly acid.

The A horizon has color of 10YR 4/2, 5/3, or 5/4. Moist color is 10YR 2/2, 3/2, or 3/3. Rock fragment content ranges from 20 to 55 percent; fragments consist of pebbles and cobbles.

The B2 horizon has color of 7.5YR 5/4 or 6/4 or of 10YR 5/4, 6/3, or 6/4. Moist color is 7.5YR 4/4 or 5/4 or 10YR 3/4, 4/3, 4/4, or 5/4. It is very gravelly loam, very gravelly sandy loam, or extremely gravelly sandy loam. Rock fragment content ranges from 35 to 80 percent; fragments consist of pebbles and cobbles.

Glenview Series

The Glenview series consists of very deep, well drained soils on hills. These soils formed in material derived from obsidian. Slope is 2 to 50 percent.

Soils of the Glenview series are fine, halloysitic, mesic Ultic Palexeralfs.

Typical pedon of a Glenview very gravelly loam in an area of Glenview-Arrowhead complex, 15 to 30 percent slopes, about 7 miles southeast of Kelseyville; 1,350 feet north and 30 feet west of the southeast corner of sec. 3, T. 12 N., R. 8 W., Clearlake Highlands quadrangle.

Ap1—0 to 1 inch; brown (7.5YR 5/4) very gravelly loam, dark brown (7.5YR 3/4) moist; weak fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; moderately smeary; few fine roots; many very fine and fine interstitial pores; 40 percent obsidian fragments 2 to 25 millimeters in diameter; neutral; clear wavy boundary.

Ap2—1 to 6 inches; brown (7.5YR 5/4) gravelly loam, dark brown (7.5YR 3/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; moderately smeary; few fine roots; many very fine interstitial pores; 30 percent obsidian fragments 2 to 25 millimeters in diameter; neutral; abrupt wavy boundary.

B1t—6 to 15 inches; reddish yellow (5YR 6/6) clay loam, yellowish red (5YR 4/6) moist; moderate fine and medium angular blocky structure; very hard, friable, sticky and plastic; moderately smeary; few fine roots; common very fine and fine interstitial pores; common moderately thick clay films on peds; 10 percent obsidian fragments 2 to 15 millimeters in diameter; neutral; gradual wavy boundary.

B21t—15 to 25 inches; reddish yellow (5YR 6/6) gravelly clay, yellowish red (5YR 4/6) moist; moderate fine and medium angular blocky structure; very hard, friable, sticky and plastic; strongly smeary; few fine roots; common very fine and fine interstitial pores; common moderately thick clay films on peds; 15 percent obsidian fragments 2 to 15 millimeters in diameter; neutral; gradual wavy boundary.

B22t—25 to 40 inches; reddish yellow (5YR 6/6) gravelly clay, yellowish red (5YR 4/6) moist; moderate fine and medium angular blocky structure; very hard, friable, very sticky and plastic; strongly smeary; few fine roots; common very fine and fine interstitial pores; common moderately thick clay films on peds; 15 percent obsidian fragments 2 to 15 millimeters in diameter; neutral; gradual wavy boundary.

B23t—40 to 65 inches; reddish yellow (5YR 6/6) gravelly clay loam, yellowish red (5YR 5/6) moist; weak fine and medium angular blocky structure; very hard, friable, very sticky and very plastic; strongly smeary; few fine roots; common very fine and fine interstitial pores; common moderately thick clay films on peds; 20 percent obsidian fragments 2 to 25 millimeters in diameter; neutral.

The thickness of the solum and depth of the profile are more than 60 inches. Mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 8 and 22 inches is dry in all parts from July 1 to October 15 and is moist in all parts from January 1 to April 15. Mineralogy is strongly influenced by amorphous material. Base saturation (sums of cations) is 40 to 70 percent throughout. Reaction is medium acid to neutral throughout.

The A horizon has color of 5YR 6/3, 6/4, or 6/6, of 7.5YR 5/2 or 5/4, or of 10YR 5/3 or 5/4. Moist color is 5YR 4/3 or 4/4, 7.5YR 3/4 or 4/4, or 10YR 3/4. The upper part of the horizon is very gravelly loam that occurs as a surface pavement, and the lower part is gravelly loam.

The B2t horizon has color of 5YR 5/6, 6/4, or 6/6 or of 7.5YR 5/6 or 6/6. Moist color is 5YR 4/4, 4/6, or 5/6 or 7.5YR 4/6, 5/4, or 5/6. The horizon is gravelly clay loam, gravelly clay, clay loam, or clay. Pebble content is 5 to 35 percent. Clay content is 30 to 50 percent, but the weighted average in the upper 20 inches of the argillic horizon is 35 to 50 percent. Clay content does not decrease by more than 20 percent from its maximum within a depth of 60 inches.

Guenoc Series

The Guenoc series consists of moderately deep, well drained soils on hills. These soils formed in material weathered from basalt. Slope is 2 to 50 percent.

Soils of the Guenoc series are fine, kaolinitic, thermic Typic Rhodoxeralfs.

Typical pedon of a Guenoc clay loam in an area of Stonyford-Guenoc complex, 30 to 50 percent slopes, 1,250 feet upslope, northwest of State Highway 20, at a point about 1.1 miles northeast of its intersection with State Highway 53; in the center of sec. 35, T. 14 N., R. 7 W., Clearlake Oaks Southeast quadrangle.

A1—0 to 3 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (2.5YR 3/4) moist; strong medium and coarse subangular blocky structure parting to moderate very fine and fine subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; common fine tubular pores and many very fine interstitial pores; 10 percent subangular pebbles 2 to 25 millimeters in diameter; neutral; clear wavy boundary.

B21t—3 to 8 inches; dark red (2.5YR 3/6) clay, dark reddish brown (2.5YR 3/4) moist; strong very fine and fine angular blocky structure; slightly hard, firm, sticky and plastic; few fine and common medium roots; common very fine and fine interstitial pores; few thin clay films on peds; 10 percent subangular pebbles 2 to 25 millimeters in diameter; neutral; clear wavy boundary.

B22t—8 to 13 inches; dark red (2.5YR 3/6) gravelly clay, dark red (2.5YR 3/6) moist; strong very fine and fine angular blocky structure; hard, firm, sticky and plastic; few fine and coarse roots and common medium roots; common very fine and fine interstitial pores; common thin and moderately thick clay films on peds; 20 percent subangular pebbles 2 to 25 millimeters in diameter; neutral; gradual wavy boundary.

B23t—13 to 23 inches; dark red (2.5YR 3/6) gravelly clay, dark red (2.5YR 3/6) moist; strong fine and medium angular blocky structure; hard, firm, sticky and plastic; common medium and few coarse roots; common very fine and fine interstitial pores; common moderately thick and thick clay films on peds; 25 percent subangular pebbles 2 to 25 millimeters in diameter; neutral; clear wavy boundary.

B24t—23 to 28 inches; dark red (2.5YR 3/6) gravelly clay, dark red (2.5YR 3/6) moist; strong fine, medium, and coarse angular blocky structure; hard, firm, sticky and plastic; few coarse and common medium roots; common very fine and fine interstitial pores; continuous thick clay films on peds; 30 percent subangular pebbles 2 to 25 millimeters in diameter; neutral; abrupt irregular boundary.

R—28 inches; hard, fractured basalt; fractures are as much as 2 millimeters wide and 10 to 60 millimeters apart.

Thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 7 and 17 inches is dry in all parts from June 15 to October 30 and is moist in all parts from January 1 to April 15. The particle-size control section averages 35 to 55 percent clay and 5 to 35 percent rock fragments. Reaction is medium acid to neutral throughout.

The A horizon has color of 5YR 3/3, 3/4, 4/3, or 4/4, of 2.5YR 3/4, 4/4, or 4/6, or of 10R 4/2, 4/3, or 4/4. Moist color is 5YR 3/2, 3/3, or 3/4 or 2.5YR 3/2, 3/4, or 3/6. Rock fragment content ranges from 0 to 30 percent; fragments consist of pebbles, cobbles, and stones.

The B2t horizon has color of 10R 4/3 or 4/4 or of 2.5YR 3/6 or 4/4. Moist color is 10R 3/4 or 3/6 or 2.5YR 3/4 or 3/6. The horizon is clay loam, clay, gravelly clay loam, gravelly clay, cobbly clay loam, or cobbly clay. Rock fragment content ranges from 5 to 35 percent; fragments consist of pebbles and cobbles.

Hambright Series

The Hambright series consists of shallow, well drained soils on hills. These soils formed in material weathered from basalt. Slope is 2 to 75 percent.

Soils of the Hambright series are loamy-skeletal, mixed, thermic Lithic Haploxerolls.

Typical pedon of a Hambright very gravelly loam in an area of Sobrante-Guenoc-Hambright complex, 2 to 15 percent slopes, along Butts Canyon Road, 1.4 miles east of its intersection with State Highway 29, then 500 feet upslope to the east; Lat. 38°44'46' N., Long. 122°35'5' W. (in an unsectionalized area), Detert Reservoir quadrangle.

A1—0 to 4 inches; reddish brown (5YR 5/3) very gravelly loam, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine and common fine roots; common very fine interstitial and tubular pores; 30 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 250 millimeters in diameter; neutral; clear wavy boundary.

B2—4 to 16 inches; reddish brown (5YR 5/3) very gravelly loam, dark reddish brown (5YR 3/3) moist; weak very fine, fine, and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine interstitial and tubular pores; 50 percent pebbles 2 to 75 millimeters in diameter and 10

percent cobbles 75 to 250 millimeters in diameter; slightly acid; abrupt irregular boundary.
R—16 to 19 inches; fractured basalt with few very fine and fine roots extending into fractures; fractures are 1 millimeter wide and 15 millimeters apart.

Depth to a lithic contact is 10 to 20 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile below a depth of about 5 inches is dry in all parts from June 15 to October 30 and is moist in all parts from December 1 to April 30. The particle-size control section contains 35 to 60 percent rock fragments consisting of varying percentages of pebbles, cobbles, and stones. Base saturation is 50 to 80 percent throughout the profile. Reaction is medium acid to neutral.

The A horizon has color of 5YR 4/3, 4/4, or 5/3, of 7.5YR 4/2 or 5/2, or of 10YR 4/3. Moist color is 5YR or 10YR 3/2 or 3/3 or 7.5YR 3/2. Organic matter content is 2 to 8 percent.

The B2 horizon has color similar to that of the A horizon except that it does not have hue of 10YR. It is very gravelly loam that is 20 to 27 percent clay. A few thin to moderately thick clay films are present in some pedons.

Haploxeralfs

Haploxeralfs are well drained and somewhat excessively drained soils on uplifted and dissected hills. These soils formed in alluvium derived from mixed sources. Slope is 50 to 75 percent.

Reference pedon of Haploxeralfs in an area of Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes, 1,340 feet west and 660 feet north of the southeast corner of sec. 24, T. 13 N., R. 7 W., Lower Lake quadrangle.

A1—0 to 5 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 4/3) moist; moderate very fine and fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine and very fine roots; common fine and medium interstitial pores and few fine tubular pores; 30 percent rounded pebbles 2 to 35 millimeters in diameter; neutral; clear wavy boundary.
B1t—5 to 10 inches; light yellowish brown (10YR 6/4) gravelly loam, yellowish brown (10YR 5/4) moist; moderate very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; few very fine, fine and medium roots; common very fine and fine interstitial pores and few very fine and fine tubular pores; few thin clay films on peds and rock fragments; 25 percent rounded pebbles 2 to 35 millimeters in diameter; neutral; clear wavy boundary.
B2t—10 to 16 inches; light brown (7.5YR 6/4) very gravelly sandy clay loam, strong brown (7.5YR 5/6) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few fine, medium, and coarse roots; common very fine interstitial pores and few very fine tubular pores; common moderately thick clay films on peds and rock fragments; 45 percent rounded pebbles 2 to 50 millimeters in diameter; slightly acid; clear wavy boundary.
B3t—16 to 23 inches; light yellowish brown (10YR 6/4) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; weak fine subangular blocky structure; slightly hard; friable, slightly sticky and slightly plastic; few medium roots; few very fine interstitial and tubular pores; common thin clay films on peds and rock fragments; 40 percent rounded pebbles 2 to 75 millimeters in diameter; slightly acid; gradual wavy boundary.
C1—23 to 43 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/6) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 50 percent rounded pebbles 2 to 50 millimeters in diameter; neutral; gradual wavy boundary.
C2—43 to 65 inches; yellowish brown (10YR 5/4) very gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, nonsticky and nonplastic; 65 percent rounded pebbles 2 to 75 millimeters in diameter; neutral.

Depth of the profile is 20 inches to more than 60 inches. The mean annual soil temperature is 57 to 63 degrees F. Reaction is medium acid to neutral. The profile has hue of 7.5YR or 10YR, value of 4, 5, 6, or 7, and chroma of 2, 3, 4, 5, or 6 when dry or moist. Texture is sandy loam, loam, sandy clay loam, sandy clay, or clay. Rock fragment content is 15 to 65 percent throughout. The particle-size control section averages 15 to 35 percent clay and 15 to 60 percent rock fragments.

Henneke Series

The Henneke series consists of shallow, somewhat excessively drained soils on hills and mountains. These soils formed in material weathered from serpentinite or peridotite. Slope is 5 to 50 percent.

Soils of the Henneke series are clayey-skeletal, serpentinitic, thermic Lithic Argixerolls.

Typical pedon of a Henneke gravelly loam in an area of Henneke-Montara-Rock outcrop complex, 15 to 50 percent slopes, on top of a knoll 20 feet west of State Highway 29, about 6,300 feet northeast of Middletown; Lat. 38°45'53' N. and Long. 122°35'40' W. (in an unsectionalized area), Middletown quadrangle.

A1—0 to 3 inches; reddish brown (5YR 5/3) gravelly loam, dark reddish brown (5YR 3/2) moist; weak fine subangular blocky structure parting to weak fine

platy; soft, very friable, nonsticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores and common very fine and fine tubular pores; 15 percent weathered angular serpentine pebbles; neutral; clear wavy boundary.

B21t—3 to 11 inches; reddish brown (5YR 4/3) gravelly clay loam, dark reddish brown (5YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; common very fine and fine roots; common very fine interstitial pores and common very fine and few fine tubular pores; few thin clay films on peds and in pores; many pressure faces; 20 percent weathered angular serpentine pebbles; mildly alkaline; clear wavy boundary.

B22t—11 to 16 inches; dark reddish brown (5YR 3/2) very gravelly clay, dark reddish brown (5YR 3/3) moist; strong fine and medium subangular blocky structure; very hard, firm, extremely sticky and extremely plastic; common very fine, fine, and medium roots; few very fine and fine interstitial pores and common very fine and few fine tubular pores; few thin clay films on peds and in pores; many pressure faces; 40 percent weathered angular serpentine pebbles and 10 percent cobbles; mildly alkaline; clear irregular boundary.

B23t—16 to 19 inches; reddish brown (2.5YR 5/4) very gravelly clay, dusky red (2.5YR 3/2) moist; moderate medium angular blocky structure; hard, firm, sticky and plastic; few very fine and fine roots; few very fine tubular pores; few thin clay films on peds and in pores; 50 percent weathered angular serpentine pebbles; mildly alkaline; abrupt irregular boundary.

R—19 inches; hard, fractured serpentinite; fractures are 1 millimeter wide and 2 to 6 millimeters apart; common very fine, fine, and medium roots in fractures.

Depth to a lithic contact is 10 to 20 inches. The mean annual soil temperature is 60 to 63 degrees F. The part of the profile below a depth of 5 inches is dry in all parts from June 15 to October 30 and is moist in all parts from December 1 to April 30. The calcium to magnesium ratio is 1:1 to 1:10.

The A horizon has color of 5YR 4/2, 5/2, or 5/3 or of 7.5YR 5/2 or 5/4. Moist color is 5YR 2/2, 3/2, or 3/3 or 7.5YR 3/2. It is medium acid to mildly alkaline. Organic matter content is 2 to 7 percent.

The B2t horizon has color of 2.5YR 4/4 or 5/4 or of 5YR 3/2, 4/3, 5/3, or 5/4. Moist color is 2.5YR 3/2 or 3/4 or 5YR 3/2, 3/3, or 3/4. The horizon is very gravelly clay loam or very gravelly clay and is 35 to 50 percent clay and 35 to 60 percent rock fragments consisting of pebbles and cobbles.

Hopland Series

The Hopland series consists of moderately deep, well drained soils on hills and mountains. These soils formed in material weathered from sandstone or shale. Slope is 9 to 75 percent.

Soils of the Hopland series are fine-loamy, mixed, mesic Typic Haploxeralfs.

Typical pedon of a Hopland loam in an area of Maymen-Hopland-Etsel association, 15 to 50 percent slopes, 20 feet upslope from State Highway 175 mileage marker 1.09; 1,850 feet east and 850 feet north of the southwest corner of sec. 9, T. 13 N., R. 10 W., Highland Springs quadrangle.

O1—0.5 inch to 0; undecomposed litter from shrubs and hardwoods.

A1—0 to 6 inches; brown (10YR 5/3) loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and nonplastic; many fine and common medium roots; many very fine and fine interstitial pores; 5 percent pebbles 2 to 25 millimeters in diameter; neutral; clear wavy boundary.

B1t—6 to 15 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure and weak coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; many fine roots, common medium roots, and few coarse roots; common very fine and fine and few medium interstitial pores and common very fine tubular pores; few thin clay films on peds; 10 percent pebbles 2 to 15 millimeters in diameter; neutral; clear wavy boundary.

B2t—15 to 34 inches; light brown (7.5YR 6/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; common fine, medium, and coarse roots; common very fine and fine and few medium interstitial pores; common moderately thick clay films on peds; 10 percent pebbles 2 to 15 millimeters in diameter; slightly acid; abrupt irregular boundary.

Cr—34 inches; soft, fractured sandstone that slakes in water within 24 hours; few fine and medium roots follow fractures.

Depth to a paralithic contact is 20 to 40 inches. Mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 7 and 18 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 15. Base saturation (sum of cations) is 75 to 95 percent throughout. The particle-size control section is 25 to 35 percent clay and 0 to 15 percent pebbles. Reaction is slightly acid or neutral.

The A horizon has color of 5YR 5/3 or 5/6, of 7.5YR 5/6, 6/4, or 6/6, or of 10YR 5/3, 5/4, 6/3, or 6/4. Moist color is 5YR 3/4, 7.5YR 3/4 or 4/4, or 10YR 3/3, 3/4, or 4/4. Texture is loam that is 15 to 25 percent clay.

The B2t horizon has color of 5YR 6/3, 6/4, or 6/6 or of 7.5YR 6/4 or 6/6. Moist color is 5YR 3/4, 4/4, or 4/6 or 7.5YR 3/4, 4/4, or 5/4. The horizon is loam or clay loam with 20 to 35 percent clay.

Jafa Series

The Jafa series consists of very deep, well drained soils on terraces and alluvial fans. These soils formed in alluvium derived from mixed sources. Slope is 2 to 30 percent.

Soils of the Jafa series are fine-loamy, mixed, mesic Ultic Palexeralfs.

Typical pedon of a Jafa loam in an area of Jafa complex, 5 to 30 percent slopes, in Mendocino National Forest, about 50 feet southwest of the intersection of Roads 18N16 and 18N53; about 500 feet north and 2,450 feet east of the southwest corner of sec. 1, T. 18 N., R. 10 W., Lake Pillsbury quadrangle.

O1 and O2—2 inches to 0; decomposed and partially decomposed conifer litter.

A11—0 to 6 inches; brown (7.5YR 5/4) loam, dark brown (10YR 3/3) moist; moderate fine and medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine interstitial pores; 10 percent rounded pebbles 2 to 25 millimeters in diameter; medium acid; clear smooth boundary.

A12—6 to 13 inches; light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 4/4) moist; moderate fine and medium granular structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and common very fine and coarse roots; many very fine and fine interstitial pores; 15 percent rounded pebbles 2 to 25 millimeters in diameter; medium acid; gradual wavy boundary.

B1t—13 to 25 inches; reddish yellow (7.5YR 6/6) gravelly loam, strong brown (7.5YR 4/6) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; many very fine and fine interstitial pores and common fine tubular pores; few moderately thick clay films on peds and in pores; 20 percent rounded pebbles 2 to 50 millimeters in diameter; medium acid; clear wavy boundary.

B21t—25 to 40 inches; reddish yellow (5YR 6/6) gravelly clay loam, yellowish red (5YR 4/6) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common fine, medium, and coarse roots; many very fine and fine interstitial pores and common fine tubular pores; common moderately thick clay films on peds and in pores; 20 percent rounded pebbles 2 to 75 millimeters in diameter; strongly acid; clear wavy boundary.

B22t—40 to 63 inches; reddish yellow (5YR 6/6) gravelly clay loam, yellowish red (5YR 5/6) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; few fine, medium, and coarse roots; common very fine, fine, and medium interstitial and tubular pores; many moderately thick clay films on peds and in pores; 25 percent rounded pebbles 2 to 75 millimeters in diameter and 2 percent rounded cobbles 75 to 150 millimeters in diameter; strongly acid; gradual wavy boundary.

B3t—63 to 85 inches; reddish yellow (5YR 6/8) gravelly clay loam, yellowish red (5YR 5/6) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few medium and coarse roots; common fine and medium interstitial pores; many moderately thick clay films on peds and in pores; 30 percent rounded pebbles 2 to 75 millimeters in diameter and 4 percent rounded cobbles 75 to 150 millimeters in diameter; strongly acid.

Thickness of the solum and depth of the profile are more than 60 inches. The mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 7 and 21 inches is dry in all parts from July 1 to October 15 and is moist in all parts from January 1 to April 30. The particle-size control section averages 25 to 35 percent clay and 5 to 35 percent rock fragments. Reaction of the solum is slightly acid to strongly acid.

The A horizon has color of 7.5YR 5/4, 5/6, or 6/4 or of 10YR 5/3, 5/4, or 6/3. Moist color is 7.5YR 3/4, 4/4, or 4/6 or 10YR 3/3, 3/4, or 4/3. Only the upper 1 inch to 7 inches has moist chroma of 3 or less.

The B2t horizon has color or 5YR 5/6, 5/8, 6/6, or 7/6 or of 7.5YR 4/6, 5/6, or 6/6. Moist color is 5YR 4/6, 5/6, or 5/8 or 7.5YR 4/6 or 5/6. The horizon is loam, clay loam, sandy clay loam, gravelly loam, gravelly clay loam, or gravelly sandy clay loam. Clay content increases with increasing depth or decreases only slightly from its maximum within 60 inches of the surface.

Some pedons have a C horizon below a depth of 60 inches that is gravelly or very gravelly clay loam or sandy clay loam.

Kekawaka Series

The Kekawaka series consists of very deep, well drained soils on mountains. These soils formed in material derived dominantly from sandstone or shale. Slope is 15 to 50 percent.

Soils of the Kekawaka series are fine, kaolinitic, mesic Ultic Palexeralfs.

Typical pedon of a Kekawaka loam in an area of Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes, about 500 feet west on Road 1NO2X, from its intersection with Road 1NO2, then 30 feet upslope; 2,400 feet south and 50 feet west of the northeast corner of sec. 28, T. 18 N., R. 10 W., Mendocino National Forest.

O1 and O2—2 inches to 0; decomposed and partially decomposed conifer needles, black oak leaves, twigs, and bark.

A11—0 to 2 inches; yellowish brown (10YR 5/4) loam, dark brown (10YR 3/3) moist; moderate very fine and fine granular structure and moderate very fine and fine subangular blocky; slightly hard, friable, slightly sticky and plastic; many very fine and fine roots; common very fine, fine, and medium interstitial pores; 10 percent pebbles; slightly acid (pH 6.5); clear wavy boundary.

A12—2 to 9 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate very fine and fine granular structure and moderate very fine and fine subangular blocky; slightly hard, friable, slightly sticky and plastic; common very fine, fine, and medium roots and many coarse roots; common very fine, fine, and medium interstitial and tubular pores; 10 percent pebbles; slightly acid (pH 6.2); gradual wavy boundary.

B21t—9 to 18 inches; reddish yellow (7.5YR 7/6) clay loam, strong brown (7.5YR 5/6) moist; strong fine and medium angular blocky structure; slightly hard, friable, sticky and plastic; common fine, medium, and coarse roots; many very fine tubular pores and common fine and medium interstitial and tubular pores; common thin clay films on peds and in pores; 10 percent pebbles; medium acid (pH 6.0); gradual wavy boundary.

B22t—18 to 28 inches; variegated reddish yellow and strong brown (7.5YR 7/6, 5/6) heavy clay loam, variegated strong brown (7.5YR 5/6, 4/6) moist; strong fine and medium angular blocky structure; slightly hard, firm, sticky and plastic; common fine, medium, and coarse roots; common very fine tubular pores and common fine and medium interstitial and tubular pores; common moderately thick clay films on peds and in pores; 10 percent pebbles; medium acid (pH 5.8); clear wavy boundary.

B23t—28 to 42 inches; variegated reddish yellow and strong brown (7.5YR 6/6, 5/6) clay, variegated yellowish red (5YR 5/6, 4/6) moist; strong fine and medium angular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine tubular pores and few fine and medium interstitial pores; appearance of red (2.5YR 4/6) continuous thick clay films on peds and in pores; 10 percent pebbles; strongly acid (pH 5.5); clear wavy boundary.

B24t—42 to 68 inches; variegated reddish yellow (5YR 6/6, 7.5YR 7/6) gravelly clay, variegated yellowish red (5YR 4/6, 5/8) moist; strong fine and medium angular blocky structure; hard, firm, sticky and plastic; few fine and medium roots; common very fine tubular pores and few fine and medium interstitial pores; appearance of red (2.5YR 4/6) continuous thick clay films on peds and in pores; 10 percent hard pebbles and 5 percent soft saprolitic pebbles; strongly acid (pH 5.5).

Thickness of the solum and depth to bedrock are 60 to 80 inches. The mean annual soil temperature is 52 to 56 degrees F. The part of the profile between depths of 7 and 17 inches is dry in all parts from July 1 to October 1 and is moist in all parts from December 15 to May 15. The particle-size control section is 35 to 55 percent clay. Reaction of the solum is slightly acid to strongly acid.

The A horizon has color of 10YR 5/4 or 6/4, of 7.5YR 5/4 or 6/4, or of 5YR 5/6 or 6/6. Moist color is 10YR 3/3 or 4/4, 7.5YR 3/2, 3/4, 4/4, or 4/6, or 5YR 3/4 or 3/6. Rock fragment content is 5 to 25 percent; fragments are pebbles.

The B2t horizon has dry color of 7.5YR 5/6, 6/6, or 7/6, of 5YR 4/6, 4/8, 5/6, 5/8, or 6/6, or of 2.5YR 4/6. Moist color is 7.5YR 4/6 or 5/6, 5YR 3/4, 4/4, 4/6, 5/6, or 5/8, or 2.5YR 3/6 or 4/6. The horizon is clay loam, clay, gravelly clay loam, or gravelly clay. Clay content averages more than 35 percent in the upper 20 inches of the B2t horizon and increases with increasing depth. Rock fragment content is 5 to 35 percent. Base saturation is 35 to 70 percent.

Kelsey Series

The Kelsey series consists of very deep, well drained soils on flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Kelsey series are coarse-loamy, mixed, thermic Fluventic Haploxerolls.

Typical pedon of Kelsey fine sandy loam, 100 feet north of Scotts Valley Road, at a point 225 feet east of the intersection of Scotts Valley Road and Hendricks Road; 2,600 feet south and 350 feet east of the northwest corner of sec. 14, T. 14 N., R. 10 W., Lakeport quadrangle.

Ap—0 to 5 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; common fine interstitial pores and few medium tubular pores; slightly acid; clear wavy boundary.

AC—5 to 11 inches; brown (10YR 5/3) fine sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, nonsticky and nonplastic;

common very fine and few fine roots; common very fine and fine interstitial pores; neutral; gradual wavy boundary.

IIC1—11 to 26 inches; pale brown (10YR 6/3) very fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine pores; neutral; clear wavy boundary.

IIIC2—26 to 33 inches; brown (10YR 5/3) fine sandy loam, dark brown (10YR 3/3) moist; weak moderate subangular blocky structure parting to single grain; soft, very friable, nonsticky and nonplastic; few fine roots; common very fine and fine interstitial pores; neutral; clear wavy boundary.

IVC3—33 to 43 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 3/3) moist; weak medium subangular blocky structure parting to single grain; soft, very friable, nonsticky and nonplastic; common very fine and fine interstitial pores; 5 percent pebbles 2 to 10 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

VC4—43 to 60 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 3/3) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and fine interstitial pores; neutral.

Thickness of the solum is 10 to 26 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 62 degrees F. The difference between the average winter and the average summer soil temperature is 25 to 30 degrees F. The part of the profile between depths of 7 and 21 inches is dry in all parts from June 1 to October 15 and is moist in all parts from January 1 to March 30. Organic matter content is 1 to 3 percent from the surface to a depth of 10 to 19 inches and is less than 1 percent below that. Organic matter content decreases irregularly with increasing depth. Reaction is slightly acid to mildly alkaline. Base saturation is 60 to 90 percent throughout the profile. The particle-size control section is 7 to 18 percent clay and is 15 percent fine sand or coarser. Rock fragment content is 0 to 15 percent.

The A horizon has color of 10YR 3/2, 4/2, 5/2, or 5/3. Moist color is 10YR 3/2 or 3/3.

The C horizon has color of 10YR 5/3, 6/3, 6/4, or 6/6. Moist color is 10YR 3/3, 3/4, 4/2, 4/3, or 4/4. The profile is stratified very fine sandy loam, fine sandy loam, sandy loam, loam, and silt loam.

Kidd Series

The Kidd series consists of shallow, somewhat excessively drained soils on hills and mountains. These soils formed in material weathered from rhyolitic tuff. Slope is 5 to 75 percent.

Soils of the Kidd series are medial, mesic Lithic Vitrandepts.

Typical pedon of a Kidd gravelly loam in an area of Forward Variant-Kidd association, 30 to 50 percent slopes, along an old logging road about 600 feet south of Western Mine Road, at a point about 0.6 mile northeast of its intersection with the Sonoma County and Lake County line; 800 feet north and 1,000 feet east of the southwest corner of sec. 16, T. 10 N., R. 7 W., Mount St. Helena quadrangle.

A1—0 to 4 inches; light gray (10YR 7/2) gravelly loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; common very fine and fine roots; common fine and medium interstitial pores; 30 percent pebbles 2 to 20 millimeters in diameter; medium acid; clear wavy boundary.

B2—4 to 13 inches; light gray (10YR 7/2) gravelly sandy loam, brown (10YR 5/3) moist; weak fine subangular blocky structure; loose, very friable, nonsticky and nonplastic; common very fine and fine roots and few medium, coarse, and very coarse roots; common fine and medium interstitial pores and few fine and medium tubular pores; 30 percent pebbles 2 to 35 millimeters in diameter; strongly acid; abrupt irregular boundary.

R—13 inches; hard, fractured rhyolitic tuff.

Depth to a lithic contact is 12 to 20 inches. The mean annual soil temperature is 55 to 59 degrees F. The profile to a depth of 12 inches or to bedrock is dry in all parts from June 5 to October 15 and is moist in all parts from December 1 to April 30. Rock fragments make up 10 to 35 percent of the profile; fragments are pebbles. Rock fragment content commonly increases as depth increases and is more than 35 percent in the lower part of the B2 horizon in some pedons. Mineralogy is influenced by amorphous material.

The A horizon has color of 7.5YR 4/4 or 5/4 or of 10YR 4/4, 5/4, 6/2, 6/4, 7/2, or 7/4. Moist color is 10YR 3/3, 4/2, 4/3, 5/2, or 5/3. It is slightly acid or medium acid.

The B2 horizon has color of 7.5YR or 10YR 5/2, 5/4, 6/2, 6/4, 7/2, or 7/4. Moist color is 7.5YR or 10YR 4/4, 5/3, or 5/4. The horizon is gravelly sandy loam or gravelly loam. It is slightly acid to strongly acid.

Kilaga Variant

The Kilaga Variant consists of very deep, moderately well drained soils on alluvial plains and stream terraces. These soils formed in alluvium derived from mixed sources. Slope is 0 to 5 percent.

Soils of the Kilaga Variant are fine, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Kilaga Variant loam, 0 to 5 percent slopes, 1,450 feet west of State Highway 29, at a point about 0.85 mile south of its intersection with State

Highway 53 at Lower Lake; 410 feet north and 100 feet west of the southeast corner of sec. 10, T. 12 N., R. 7 W., Lower Lake quadrangle.

A11—0 to 6 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; common very fine and fine interstitial pores and few very fine and fine tubular pores; slightly acid; gradual wavy boundary.

A12—6 to 10 inches; pale brown (10YR 6/3) loam, dark brown (10YR 3/3) moist; moderate fine and medium angular blocky structure; hard, friable, slightly sticky and slightly plastic; few very fine and common fine roots; common very fine and fine interstitial pores and few very fine and fine tubular pores; few thin silt coatings on peds and in pores; 2 percent pebbles 2 to 5 millimeters in diameter; slightly acid; gradual wavy boundary.

B1t—10 to 35 inches; grayish brown (2.5YR 5/2) clay loam, dark brown (10YR 4/3) moist; moderate medium and coarse angular blocky structure; hard, firm, sticky and plastic; few fine roots; common very fine and fine interstitial pores and few very fine and fine tubular pores; few thin clay films on peds and in pores; slightly acid; clear wavy boundary.

B21t—35 to 39 inches; light brownish gray (2.5YR 6/2) clay loam, variegated dark brown (10YR 4/3) and yellowish brown (10YR 5/3) moist; strong fine and medium angular blocky structure; hard, firm, sticky and plastic; few fine roots; common fine interstitial pores and few fine tubular pores; common thick clay films on peds and in pores; 5 percent pebbles 2 to 20 millimeters in diameter; neutral; clear wavy boundary.

B22t—39 to 42 inches; variegated light brownish gray (10YR 6/2) and yellowish brown (10YR 5/6) clay loam, dark yellowish brown (10YR 4/4) moist; common large distinct brown (10YR 5/3) mottles; moderate fine and medium angular blocky structure; very hard, very firm, sticky and plastic; few fine roots; common very fine interstitial pores and few fine tubular pores; common thick clay films on peds and in pores; 2 percent pebbles 2 to 15 millimeters in diameter; slightly acid; clear wavy boundary.

B23t—42 to 59 inches; variegated pale brown (10YR 6/3) and yellowish brown (10YR 5/6) clay, dark yellowish brown (10YR 4/4) moist; common fine distinct strong brown (7.5YR 5/8) mottles; moderate fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; few fine roots; few very fine interstitial and tubular pores; common thick clay films on peds and in pores; 2 percent pebbles 2 to 10 millimeters in diameter; medium acid; gradual wavy boundary.

B24t—59 to 71 inches; brown (10YR 5/3) clay, dark yellowish brown (10YR 4/4) moist; moderate medium prismatic structure parting to moderate medium and fine angular blocky; very hard, very firm, very sticky and very plastic; few fine roots; few very fine interstitial and tubular pores; many thick clay films on peds and in pores; slightly acid.

Thickness of the solum and depth of the profile are 60 to 80 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 13 inches is dry in all parts from July 1 to September 30 and is moist in all parts from December 1 to April 15. A seasonal high water table is at a depth of 40 to 72 inches in winter. The water table drops below a depth of 72 inches during the growing season. Mottles are at a depth of 36 to 60 inches. The solum has 0 to 10 percent pebbles.

The A horizon has color of 10YR 5/2, 6/2, or 6/3 or of 2.5Y 5/2 or 6/2. Moist color is 10YR 3/2, 3/3, or 4/3. The upper 4 to 10 inches of the horizon has moist value of 3. Organic matter content is 0.25 to 1.0 percent below a depth of 8 inches. The horizon is slightly acid or neutral.

The B2t horizon has color of 10YR 4/3, 5/2, 5/3, 5/6, 6/2, or 6/3 or of 2.5YR 5/2 or 6/2. Moist color is 10YR 3/4, 4/3, 4/4, or 5/3. Mottles are 10YR or 7.5YR 5/3, 5/6, or 5/8. The horizon is clay loam, silty clay, or clay and has 35 to 50 percent clay. It is medium acid to neutral.

Konocti Series

The Konocti series consists of moderately deep, well drained soils on hills and mountains. These soils formed in material weathered from andesite, basalt, or dacite. Slope is 2 to 75 percent.

Soils of the Konocti series are loamy-skeletal, mixed, thermic Ultic Haploxeralfs.

Typical pedon of a Konocti cobbly loam (fig. 6) in an area of Benridge-Konocti association, 30 to 50 percent slopes, about 2 miles east of Kelseyville on Konocti Road, 1,300 feet up the road from benchmark 2493; 2,300 feet east and 1,150 feet south of the northwest corner of sec. 19, T. 13 N., R. 8 W., Kelseyville quadrangle.

A1—0 to 4 inches; brown (10YR 4/3) cobbly loam, dark brown (7.5YR 3/2) moist; strong very fine, fine, medium, and coarse granular structure; slightly hard, very friable, nonsticky and slightly plastic; many fine roots; many very fine and fine interstitial pores; 10 percent pebbles and 20 percent cobbles; neutral; clear wavy boundary.

B1—4 to 8 inches; brown (10YR 5/3) cobbly loam, dark brown (10YR 3/3) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky

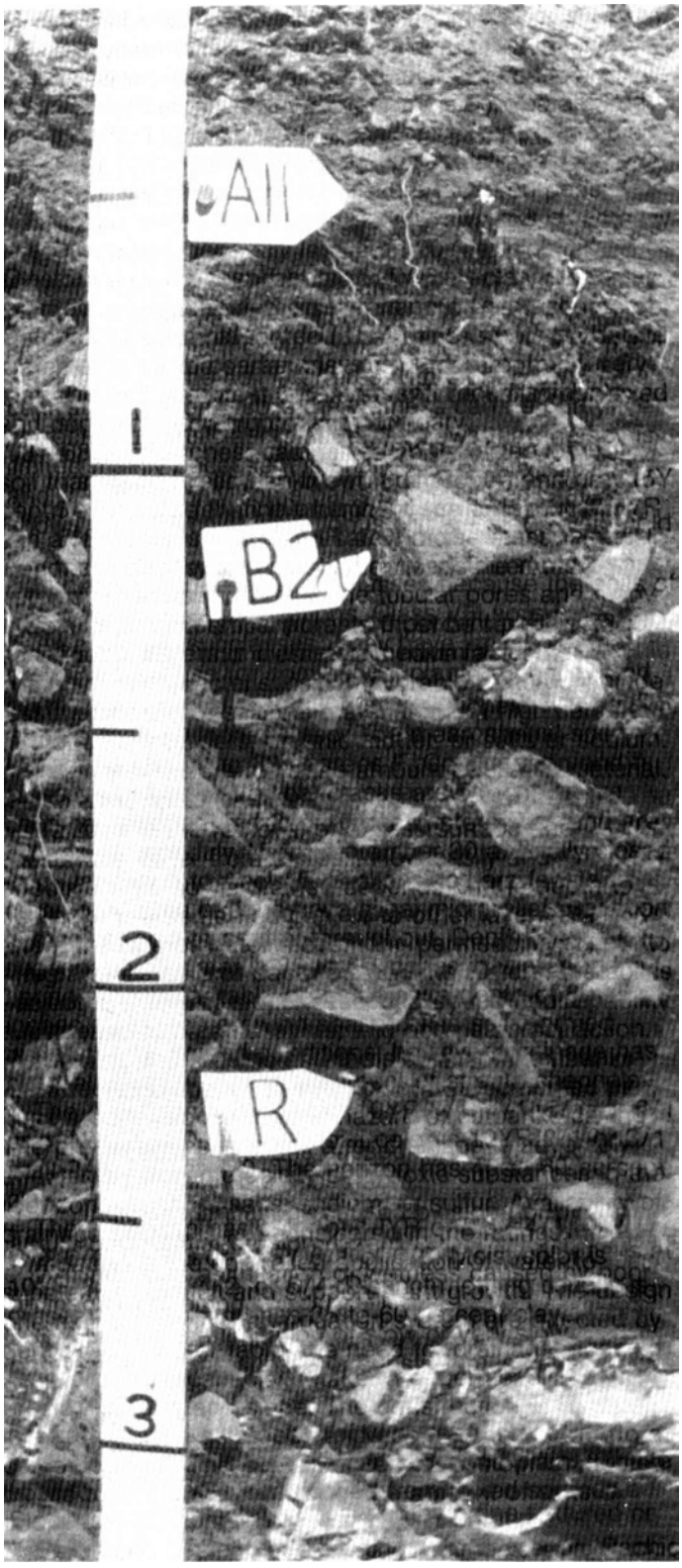

Figure 6.—Profile of a Konocti cobbly loam in an area of Benridge-Konocti association, 30 to 50 percent slopes.

and slightly plastic; many very fine and fine roots; common very fine and fine tubular pores and many very fine interstitial pores; 5 percent pebbles and 10 percent cobbles; neutral; clear wavy boundary.

B21t—8 to 16 inches; brown (7.5YR 5/4) stony loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; few very fine and fine roots; common very fine and few medium tubular pores; few thin clay films on peds and in pores; 5 percent pebbles, 5 percent cobbles, and 10 percent stones; neutral; gradual wavy boundary.

B22t—16 to 25 inches; light reddish brown (5YR 6/4) very stony loam, reddish brown (5YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few very fine and fine roots; common very fine and few medium pores; common thin clay films in pores and on peds; 10 percent pebbles, 5 percent cobbles, and 20 percent stones; neutral; diffuse wavy boundary.

B23t—25 to 32 inches; light reddish brown (5YR 6/4) very stony loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and plastic; few fine roots; few very fine tubular pores; few thin clay films on peds, in pores, and bridging mineral grains; 15 percent pebbles, 15 percent cobbles, and 25 percent stones; pockets and fractures filled with material that resembles that in the B22t horizon; neutral; clear irregular boundary.

C—32 to 39 inches; reddish yellow (5YR 6/6) very stony loam, yellowish red (5YR 4/6) moist; weak medium subangular blocky structure; slightly hard, friable, sticky and slightly plastic; few very fine and fine tubular pores; few thin clay films on peds and in pores; 25 percent pebbles, 10 percent cobbles, and 20 percent stones; slightly acid; abrupt irregular boundary.

R—39 inches; fractured, slightly weathered dacite; fractures are 5 to 20 millimeters wide and 75 to 300 millimeters apart around subrounded cobbles and stones.

The thickness of the solum is 15 to 40 inches, and the depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 6 and 20 inches is dry in all parts from June 15 to October 15 and is moist in all parts from January 1 to April 30. Reaction is slightly acid or neutral throughout the profile. Some pedons do not have a B1 horizon or a C horizon.

The A horizon has color of 7.5YR 5/2, 5/4, or 6/2 or of 10YR 4/3, 5/2, or 5/3. Moist color is 5YR 3/3, 7.5YR 3/2 or 3/4, or 10YR 3/3. The horizon is gravelly loam, cobbly loam, or stony loam. Rock fragment content ranges from 15 to 35 percent, of which 0 to 20 percent

is cobbles, 0 to 10 percent is stones, and 15 to 25 percent is pebbles.

The B2t horizon has color of 5YR 6/3 or 6/4 or of 7.5YR 5/4 or 6/4. Moist color is 5YR 3/4, 4/3, 4/4, or 5/4 or 7.5YR 3/4 or 4/4. The horizon is stony loam, very stony loam, stony clay loam, or very stony clay loam that is 22 to 35 percent clay. Rock fragment content ranges from 20 to 60 percent, of which 5 to 20 percent is pebbles, 5 to 20 percent is cobbles, and 10 to 30 percent is stones. Rock fragment content averages 35 to 55 percent in the upper 20 inches. Base saturation (sum of cations) is 60 to 80 percent and is less than 75 percent in at least some part of the profile.

Konocti Variant

The Konocti Variant consists of deep, well drained soils on volcanic hills. These soils formed in material weathered from basalt. Slope is 2 to 30 percent.

Soils of the Konocti Variant are loamy-skeletal, mixed, thermic Ultic Haploxeralfs.

Typical pedon of a Konocti Variant in an area of Konocti Variant-Konocti-Hambright complex, 2 to 15 percent slopes, about 200 feet east of Long Valley Road, at a point 4.5 miles from its intersection with State Highway 20; 300 feet north and 2,300 feet east of the southwest corner of sec. 24, T. 14 N., R. 7 W., Clearlake Oaks Southeast quadrangle.

O2—0.5 inch to 0; partially decomposed layer of oak and manzanita leaves and twigs.

A1—0 to 4 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common medium roots; many very fine and fine interstitial pores; 25 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

B1t—4 to 11 inches; brown (7.5YR 5/4) very gravelly loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many fine and medium roots and common very fine and coarse roots; many very fine and fine interstitial pores; few thin clay films on peds and in pores; 25 percent pebbles and 10 percent cobbles; neutral; gradual wavy boundary.

B21t—11 to 22 inches; strong brown (7.5YR 5/6) very gravelly clay loam, strong brown (7.5YR 4/6) moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many fine, medium, and coarse roots; common very fine, fine, and medium interstitial pores; common thin clay films on peds and in pores; 25 percent pebbles and 15 percent cobbles; neutral; gradual wavy boundary.

B22t—22 to 39 inches; strong brown (7.5YR 5/6) very cobbly clay loam, brown (7.5YR 4/4) moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; many fine and medium roots and common coarse roots; many fine and medium interstitial pores; common moderately thick clay films on peds and in pores; 20 percent pebbles, 20 percent cobbles, and 5 percent stones; slightly acid; clear wavy boundary.

B3t—39 to 53 inches; light brown (7.5YR 6/4) very stony clay loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; slightly hard, firm, sticky and plastic; common fine, medium, and coarse roots; common fine and medium interstitial pores; common thin clay films on peds and in pores; 20 percent pebbles, 20 percent cobbles, and 5 percent stones; slightly acid; gradual wavy boundary.

R—53 inches; rounded and fractured cobbles, stones, and boulders of olivine basalt with some soil material and roots in voids and fractures.

Thickness of the solum and depth to a lithic contact are 40 to 60 inches. Mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 8 and 20 inches is dry in all parts from June 15 to October 15 and is moist in all parts from January 1 to April 15. Reaction is neutral or slightly acid throughout the profile.

The A horizon has color of 10YR 5/3 or 5/4 or of 7.5YR 5/2 or 5/4. Moist color is 10YR 3/3 or 3/4 or 7.5YR 3/2 or 3/4. The horizon is 4 to 10 inches thick. It is gravelly loam or cobbly loam that is 18 to 25 percent clay.

The B2t horizon has hue of 7.5YR or 5YR 5/4, 5/6 or 6/4. Moist color is 7.5YR or 5YR 3/4, 4/4, or 4/6. The horizon is very gravelly clay loam, very cobbly clay loam, or very stony clay loam that is 27 to 35 percent clay. Rock fragment content ranges from 35 to 55 percent and consists of varying percentages of pebbles, cobbles, stones, and boulders. Base saturation (sum of cations) is 40 to 75 percent.

Landlow Variant

The Landlow Variant consists of very deep, poorly drained soils in basins and on flood plains. These soils are derived from recent lacustrine deposits. Slope is 0 to 2 percent.

Soils of the Landlow Variant are fine, montmorillonitic, thermic Aquic Haploxerolls.

Typical pedon of Landlow Variant silty clay loam, 1,600 feet north of the north end of Blower Road, 500 feet south and 1,300 feet west of the northeast corner of sec. 33, T. 14 N., R. 9 W., Lucerne quadrangle.

A1—0 to 7 inches; grayish brown (2.5Y 5/2) silty clay loam, black (10YR 2/1) moist; common fine distinct brownish yellow (10YR 6/6) mottles, yellowish brown (10YR 4/4) moist; weak medium and coarse

subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, sticky and plastic; many very fine, fine, and medium roots; many fine interstitial pores and common fine tubular pores; mildly alkaline; clear wavy boundary.

B2—7 to 23 inches; grayish brown (2.5Y 5/2) silty clay, very dark grayish brown (2.5Y 3/2) moist; common fine distinct brownish yellow (10YR 6/6) mottles, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common fine interstitial and tubular pores; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

C1—23 to 35 inches; olive gray (5Y 5/2) silty clay loam, very dark gray (10YR 3/1) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine roots; common fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

C2—35 to 42 inches; light olive gray (5Y 6/1) silty clay loam, very dark gray (10YR 3/1) moist; weak very fine and fine subangular blocky structure; slightly hard, friable, slightly sticky and plastic; few fine roots; few fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

C3—42 to 84 inches; gray (5Y 6/1) silty clay loam, very dark gray (5Y 3/1) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; few fine tubular pores; slightly effervescent; disseminated lime; moderately alkaline.

Thickness of the solum is 16 to 40 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 10 and 40 inches is dry in all parts from July 30 to October 15 and is moist in all parts from December 1 through June 15. Depth to a seasonal high water table is 6 to 12 inches in winter and spring. The water table drops below a depth of 60 inches in summer. These soils are occasionally flooded for periods of 2 to 7 days in winter and spring.

The A horizon has color of 10YR 5/2 or of 2.5Y 4/2 or 5/2. Moist color is 10YR 2/1, 3/1, or 3/2 or 2.5Y 2/2 or 3/2.

The B2 horizon has colors similar to those of the A horizon. Common distinct mottles with color of 10YR or 2.5Y 6/6 or 7/2 are present. In some pedons mottles have color of 5B 5/1 or 6/1 or 5BG 6/1 at the boundary between the B and C horizons. The B2 horizon is silty clay or clay that is 40 to 60 percent clay.

The C horizon has color of 10YR, 2.5Y, or 5Y 5/2, 6/1, or 6/2. Moist color is 10YR, 2.5Y, or 5Y 3/1 or 4/1. Some variegated colors that have hue of 5B or 5BG are present in places. The horizon is silty clay loam, silty clay, or clay that is 35 to 60 percent clay.

Lupoyoma Series

The Lupoyoma series consists of very deep, moderately well drained soils on flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Lupoyoma series are fine-silty, mixed, thermic Cumulic Ultic Haploxerolls.

Typical pedon of Lupoyoma silt loam, protected, 150 feet west of Elk Mountain Road, at a point about 0.2 mile north of its intersection with State Highway 20, 1,100 feet south and 140 feet west of the northeast corner of sec. 12, T. 15 N., R. 10 W., Upper Lake quadrangle.

Ap1—0 to 5 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; moderate fine subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine and medium roots; many very fine and fine interstitial pores and few very fine tubular pores; slightly acid; clear smooth boundary.

Ap2—5 to 12 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; weak coarse prismatic structure parting to coarse and very coarse subangular blocky; hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine and medium roots; common very fine and fine interstitial pores and many very fine and few fine tubular pores; slightly acid; clear smooth boundary.

A13—12 to 20 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine and medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots, common fine roots, and few medium roots; common very fine and fine interstitial pores and many very fine and few fine tubular pores; slightly acid; clear smooth boundary.

A14—20 to 31 inches; brown (10YR 5/3) silt loam, dark brown (10YR 3/3) moist; weak fine and medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; many very fine and few fine roots; common fine interstitial pores and many very fine and common fine tubular pores; slightly acid; clear smooth boundary.

AC—31 to 42 inches; brown (10YR 5/3) silt loam, very dark grayish brown (10YR 3/2) moist; few fine faint light brownish gray (2.5Y 6/2) mottles, dark grayish brown (2.5Y 4/2) moist; weak fine prismatic structure parting to weak fine subangular blocky; slightly hard, friable, sticky and slightly plastic; common very fine and few fine roots; few very fine

interstitial pores and common very fine and few fine tubular pores; neutral acid; clear smooth boundary.

C1—42 to 49 inches; variegated brown (10YR 5/3) and very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) moist; few fine and common distinct light brownish gray (2.5Y 6/2) mottles, dark grayish brown (2.5Y 4/2) moist; weak fine and medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; few very fine interstitial pores and common very fine and fine tubular pores; neutral; clear smooth boundary.

C2—49 to 84 inches; variegated brown (10YR 5/3) and very dark grayish brown (10YR 3/2) silt loam, dark grayish brown (10YR 4/2) moist; few fine and common distinct light brownish gray (2.5YR 6/2) mottles, dark grayish brown (2.5Y 4/2) moist; weak fine and medium prismatic structure parting to weak fine subangular blocky; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; common very fine interstitial pores and many very fine and fine tubular pores; mildly alkaline.

Depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 61 degrees F. The part of the profile between depths of 6 and 18 inches is dry in all parts from June 15 to October 15 and is moist from January 1 to April 15. Base saturation is 50 to 75 percent throughout the profile. Organic matter content is 1 to 2 percent in the A horizon and decreases irregularly with increasing depth. The particle-size control section is 18 to 35 percent clay and 5 to 15 percent fine sand or coarser textured material.

The A horizon has color of 10YR 5/2 or 5/3. Moist color is 10YR 3/2 or 3/3. The horizon is medium acid to neutral and is 20 to 30 inches thick.

The C horizon has color of 10YR 4/2, 4/3, 5/3, 6/2, 6/3, or 6/4 or of 2.5Y 6/2. Moist color is 7.5YR 4/4 or 4/6, 10YR 3/1, 3/2, 3/3, or 4/2, or 2.5Y 4/2. The horizon is very fine sandy loam, loam, silt loam, or silty clay loam. Some pedons do not have mottles. Lenses of fine sandy loam or sandy loam are present below a depth of 40 inches. The horizon is slightly acid to mildly alkaline.

Manzanita Series

The Manzanita series consists of very deep, well drained soils on terraces. These soils formed in alluvium derived from mixed sources. Slope is 2 to 25 percent.

Soils of the Manzanita series are fine-loamy, mixed, thermic Ultic Palexeralfs.

Typical pedon of Manzanita loam, 2 to 5 percent slopes, about 225 feet south of the junction of Scotts Valley Road and Hartley Cemetery Road; 2,000 feet north and 1,300 west of the southeast corner of sec. 14, T. 14 N., R. 10 W., Lakeport quadrangle.

Ap—0 to 5 inches; light yellowish brown (10YR 6/4) loam, brown (7.5YR 4/4) moist; massive; hard, friable, slightly sticky and slightly plastic; common very fine roots; few fine tubular pores; 6 percent pebbles 2 to 50 millimeters in diameter; very strongly acid; abrupt smooth boundary.

A3—5 to 19 inches; strong brown (7.5YR 5/6) loam, dark brown (7.5YR 3/4) moist; moderate very fine and fine granular structure; slightly hard, very friable, slightly sticky and plastic; common very fine and fine roots and few coarse roots; common very fine, fine, and medium tubular pores and many very fine interstitial pores; 2 percent pebbles 5 to 20 millimeters in diameter; medium acid; gradual wavy boundary.

B1t—19 to 28 inches; strong brown (7.5YR 5/6) loam, yellowish red (5YR 5/6) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and few medium roots; common very fine, fine, and medium tubular pores and many very fine interstitial pores; few thin clay films on peds and in pores; 4 percent pebbles and 5 percent black shot 5 to 20 millimeters in diameter; slightly acid; clear irregular boundary.

B21t—28 to 43 inches; variegated strong brown (7.5YR 5/6) and yellowish red (5YR 4/6) clay loam, yellowish red (5YR 4/6) and dark red (2.5YR 3/6) moist; weak fine and medium angular blocky structure; slightly hard, friable, sticky and very plastic; few very fine roots; common very fine and fine tubular pores and many fine interstitial pores; common moderately thick and thick clay films on peds and in pores; 5 percent pebbles 2 to 20 millimeters in diameter; medium acid; gradual wavy boundary.

B22t—43 to 56 inches; variegated yellowish red (5YR 4/6) and strong brown (7.5YR 5/8) clay loam, dark red (2.5YR 3/6) and strong brown (7.5YR 5/6) moist; weak fine and medium angular blocky structure; hard, friable, sticky and plastic; few very fine roots; common very fine and fine tubular pores and many fine interstitial pores; many moderately thick and thick clay films on peds and in pores; 2 percent pebbles 2 to 20 millimeters in diameter; medium acid; clear wavy boundary.

B3t—56 to 84 inches; variegated yellowish red (5YR 4/6) and strong brown (7.5YR 5/8) clay loam, dark red (2.5YR 3/6) and strong brown (7.5YR 5/6) moist; weak coarse angular blocky structure; hard, friable, sticky and plastic; few very fine tubular pores; common moderately thick clay films on peds and in pores; 12 percent pebbles 2 to 75 millimeters in diameter; strongly acid.

Thickness of the solum and depth of the profile are more than 60 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between

depths of 7 and 20 inches is dry in all parts from June 1 to October 15 and is moist in all parts from January 1 to April 15. Base saturation (sum of cations) is 50 to 75 percent throughout the profile. Reaction is very strongly acid to neutral throughout. The particle-size control section averages 25 to 35 percent clay and 5 to 30 percent pebbles. Clay mineralogy is high in kaolinite.

The A horizon has color of 7.5YR 5/2, 5/4, or 5/6 or of 10YR 4/3, 5/3, or 6/4. Moist color is 7.5YR 3/2, 3/4, 4/3, or 4/4 or 10YR 3/3 or 4/3. Moist value and chroma of 3.5 or less are common in the upper 0 to 6 inches. The profile is loam or gravelly loam that is 5 to 30 percent black shot and pebbles. Some pedons do not have an A3 horizon.

The B2t horizon has color of 2.5YR 4/6, 4/8, 5/6, or 5/8, of 5YR 4/6, 5/6, 5/8, 6/6, 7/6, or 7/8, or of 7.5YR 5/6, 5/8, 6/6, 6/8, 7/6, or 7/8. Moist color is 2.5YR 3/6 or 4/6, 5YR 3/6, 4/6, 4/8, or 5/6, or 7.5YR 5/6. In some pedons this horizon does not have variegated colors. The horizon is clay loam, clay, gravelly sandy clay loam, gravelly clay loam, or gravelly clay and has 5 to 35 percent pebbles. The lower part of the argillic horizon, below the particle-size control section, is 35 to 50 percent clay. Some pedons do not have a B1t or B3t horizon.

Marpa Series

The Marpa series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from sandstone. Slope is 30 to 75 percent.

Soils of the Marpa series are loamy-skeletal, mixed, mesic Ultic Haploxeralfs.

Typical pedon of a Marpa gravelly loam in an area of Speaker-Marpa-Sanhedrin gravelly loams, 30 to 50 percent slopes, on Middle Mountain, northwest of Hunter Point; 800 feet north and 1,375 feet west of the southeast corner of sec. 21, T. 16 N., R. 10 W., Upper Lake quadrangle.

O1 and O2—1.5 inches to 0; decomposed and partially decomposed conifer needles, oak leaves, twigs, and bark.

A11—0 to 5 inches; light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, friable, nonsticky and nonplastic; many very fine roots and common fine and medium roots; many very fine and common fine and medium interstitial pores; 15 percent pebbles 2 to 75 millimeters in diameter; medium acid; clear wavy boundary.

A12—5 to 10 inches; light brown (7.5YR 6/4) gravelly loam, brown (7.5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, friable, slightly sticky and slightly plastic; common very fine, fine, and medium roots; many very fine and common fine and medium interstitial pores; 15 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 150 millimeters in diameter; medium acid; clear wavy boundary.

B1t—10 to 15 inches; brown (7.5YR 5/4) gravelly loam, reddish brown (5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine and common fine and medium interstitial pores; few thin clay films on peds and in pores; 25 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 150 millimeters in diameter; medium acid; clear wavy boundary.

B2t—15 to 20 inches; strong brown (7.5YR 5/6) very gravelly clay loam, reddish brown (5YR 5/4) moist; moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and plastic; many very fine and fine roots, common medium roots, and few coarse roots; many very fine and common fine and medium interstitial pores; common moderately thick clay films on peds and in pores; 35 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 150 millimeters in diameter; medium acid; clear wavy boundary.

B3t—20 to 25 inches; strong brown (7.5YR 5/6) very gravelly clay loam, reddish brown (5YR 5/4) moist; massive; hard, firm, sticky and plastic; few very fine and fine roots; few very fine and fine interstitial pores; common moderately thick clay films in pores; 40 percent pebbles 2 to 75 millimeters in diameter and 15 percent cobbles 75 to 150 millimeters in diameter; medium acid; clear irregular boundary.

R—25 inches; hard, fractured sandstone; fractures are 1 to 15 millimeters wide and 25 to 125 millimeters apart; few very fine and fine roots in fractures.

Thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 9 and 25 inches is dry in all parts from July 1 to October 15 and is moist in all parts from January 1 to April 1. Base saturation (sum of cations) is 35 to 50 percent throughout the profile. Reaction is slightly acid to strongly acid throughout.

The A horizon has color of 7.5YR 5/4 or 6/4 or of 10YR 5/3, 5/4, 6/3, or 6/4. Moist color is 7.5YR 4/2 or 4/4 or 10YR 3/3, 4/3, or 4/4. The horizon is gravelly loam with 15 to 25 percent pebbles and 0 to 10 percent cobbles.

The B2t horizon has color of 5YR 5/4 or 6/4, of 7.5YR 5/4, 5/6, or 6/4, or of 10YR 5/4, 6/3, or 6/4. Moist color is 5YR 4/4 or 5/4, 7.5YR 3/4, 4/4, or 5/4, or 10YR 4/4 or 5/4. The horizon is very gravelly clay loam or very cobbly clay loam that is 27 to 35 percent clay. Rock fragment content ranges from 35 to 60 percent; fragments are pebbles and cobbles.

Maxwell Series

The Maxwell series consists of very deep, somewhat poorly drained soils in basins and on basin rims. These soils formed in alluvium derived from serpentinitic rock. These soils are on valley floors adjacent to serpentine uplands. Slope is 0 to 8 percent.

Soils of the Maxwell series are fine, montmorillonitic, thermic Typic Pelloxererts.

Typical pedon of Maxwell clay loam, 0 to 2 percent slopes, about 1 mile east of Middletown, 1,650 feet northeast of Butts Canyon Road, from a point 0.7 mile east of its intersection with State Highway 29; Lat. 38°45'20' N., Long. 122°35'31' W. (in an unsectionalized area), Middletown quadrangle.

Ap1—0 to 3 inches; dark gray (5Y 4/1) clay loam, very dark gray (5Y 3/1) moist; strong very coarse angular blocky structure parting to moderate very coarse and coarse platy; hard, friable, slightly sticky and plastic; common very fine and fine roots; few very fine tubular pores; common very fine interstitial pores; 2 percent pebbles; moderately alkaline; abrupt smooth boundary.

Ap2—3 to 6 inches; dark gray (5Y 4/1) clay loam, very dark gray (5Y 3/1) moist; strong very coarse subangular blocky structure parting to strong very coarse platy; very hard, firm, sticky and plastic; common very fine roots; few very fine interstitial and tubular pores; moderately alkaline; clear smooth boundary.

A13—6 to 22 inches; gray (N 5/0) clay, very dark gray (N 3/0) moist; strong coarse and very coarse prismatic structure parting to moderate fine angular blocky; very hard, firm, sticky and plastic; common very fine and few fine roots; common very fine tubular pores; few intersecting slickensides; clay loam from Ap horizon fills vertical cracks; moderately alkaline; gradual wavy boundary.

A14—22 to 38 inches; gray (N 5/0) clay, very dark gray (N 3/0) moist; weak coarse and very coarse angular blocky structure; very hard, friable, sticky and plastic; few very fine roots; few fine tubular pores; common intersecting slickensides; moderately alkaline; gradual wavy boundary.

C1ca—38 to 53 inches; gray (N 5/0) clay, very dark gray (N 3/0) moist; weak fine, medium, and coarse angular blocky structure; very hard, friable, sticky and plastic; few very fine roots; common very fine tubular pores; violently effervescent; few medium irregular soft masses of lime; common intersecting slickensides; moderately alkaline; gradual wavy boundary.

C2ca—53 to 68 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak coarse and very coarse angular blocky structure; very hard, firm, sticky and plastic; few very fine roots; violently effervescent; few fine and medium irregular soft masses of lime; few intersecting slickensides; streaks of C1ca horizon material in vertical cracks; moderately alkaline; gradual wavy boundary.

C3ca—68 to 81 inches; gray (5Y 5/1) clay, dark gray (5Y 4/1) moist; weak coarse and very coarse angular blocky structure; very hard, firm, sticky and plastic; violently effervescent; common medium and large irregular soft masses of lime; few intersecting slickensides; moderately alkaline; abrupt wavy boundary.

C4ca—81 to 84 inches; variegated light gray (5Y 7/1) and gray (5Y 5/1) clay, light gray (5Y 7/1) and dark gray (5Y 4/1) moist; weak very coarse angular blocky structure; very hard, friable, sticky and plastic; violently effervescent; many large irregular soft masses of lime; few intersecting slickensides; moderately alkaline.

Depth to free carbonates is 24 to 48 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. Cracks open and close once a year. Vertical cracks are 40 to 100 centimeters deep and 5 to 20 centimeters wide; and they are fully open from July 15 to September 30 and are fully closed from January 1 to April 15. Slickensides are few to common below the Ap horizon. The profile has a calcium to magnesium ratio of 1:1 to 1:10. Reaction is neutral to moderately alkaline throughout the profile.

The A horizon has color of N 5/0, 10YR 4/1, or 5Y 4/1. Moist color is N 3/0, 10YR 3/1, or 5Y 3/1. The horizon is 20 to 55 inches thick.

The C horizon has color of N 5/0 or 10YR, 2.5Y, or 5Y 5/1 or 7/1. Moist color is N 3/0, 4/0, or 5/0 or 10YR, 2.5Y, or 5Y 4/1, 5/1, or 7/1. Chroma when dry or moist is 0 or 1 to a depth of 50 inches and is 1 to 3 below a depth of 50 inches. The horizon is silty clay or clay that is 40 to 55 percent clay.

Mayacama Series

The Mayacama series consists of moderately deep, somewhat excessively drained soils on hills and mountains. These soils formed in material weathered from sandstone or metamorphosed sandstone. Slope is 9 to 75 percent.

Soils of the Mayacama series are loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical pedon of a Mayacama very gravelly sandy loam in an area of Maymen-Etsel-Mayacama complex, 30 to 75 percent slopes, about 2.3 miles north on Road 24N02, from its junction with Road 15N01, then about 50 feet upslope, Mendocino National Forest; Lat. 39°11'45' N., Long. 122°37'30' W. (in an unsectionalized area), Clearlake Oaks Northeast quadrangle.

A1—0 to 5 inches; pale brown (10YR 6/3) very gravelly sandy loam, dark yellowish brown (10YR 3/4) moist; moderate medium subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine roots; common medium and coarse interstitial pores; 50 percent pebbles and 5 percent cobbles; neutral; clear wavy boundary.

B1—5 to 16 inches; very pale brown (10YR 7/4) very gravelly sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and many medium roots; common medium and coarse interstitial pores; 45 percent pebbles and 5 percent cobbles; medium acid; clear irregular boundary.

B2—16 to 31 inches; very pale brown (10YR 7/4) very gravelly sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common medium, coarse, and very coarse roots; common medium and coarse interstitial pores; 45 percent pebbles and 15 percent cobbles; medium acid; clear irregular boundary.

R—31 to 35 inches; very hard, fractured sandstone; fractures 25 millimeters apart and less than 1 millimeter wide; few fine roots in fractures.

Depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature is 54 to 59 degrees F. The part of the profile between depths of 15 and 31 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 15 to April 15. The particle-size control section is 15 to 25 percent clay and 35 to 60 percent rock fragments consisting of pebbles and cobbles. Base saturation is 40 to 60 percent throughout the profile. An erosion pavement 0.5 to 1.0 inch thick is present in some pedons.

The A horizon has color of 7.5YR 5/4 or 6/4 or of 10YR 4/3, 5/3, 5/4, 6/3, or 6/4. Moist color is 7.5YR 3/4 or 4/4 or 10YR 3/4, 4/3, or 4/4. The horizon is medium acid to neutral.

The B horizon has color of 7.5YR 6/4 or 7/4 or of 10YR 4/3, 5/3, 5/4, 6/4, or 7/4. Moist color is 7.5YR 4/4, 4/6, or 5/4 or 10YR 4/3, 4/4, 5/4, or 5/6. The horizon is very gravelly loam, very gravelly sandy loam, or very gravelly sandy clay loam. In some pedons this horizon is cobbly. It is slightly acid or medium acid.

Maymen Series

The Maymen series consists of shallow, somewhat excessively drained soils on hills and mountains. These soils formed in material weathered from sandstone or shale. Slope is 9 to 75 percent.

Soils of the Maymen series are loamy, mixed, mesic Dystric Lithic Xerochrepts.

Typical pedon of a Maymen gravelly loam in an area of Maymen-Etsel-Snook complex, 15 to 30 percent slopes, about 800 feet east and 25 feet north of Hunter Point; 2,150 feet north and 1,000 feet west of the southeast corner of sec. 27, T. 16 N., R. 10 W., Upper Lake quadrangle.

A1—0 to 4 inches; light yellowish brown (10YR 6/2) gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate fine and medium subangular blocky structure and moderate medium, coarse, and very coarse platy; slightly hard, friable, nonsticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine tubular pores; 15 percent pebbles; medium acid; clear smooth boundary.

B2—4 to 12 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; moderate very fine and medium angular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine tubular and interstitial pores; 20 percent pebbles; medium acid; abrupt irregular boundary.

R—12 to 20 inches; fractured sandstone; fractures are 50 to 150 millimeters apart and less than 2 millimeters wide; few fine and medium roots in fractures.

Depth to a lithic contact is 12 to 20 inches. The mean annual soil temperature is 50 to 59 degrees F. The part of the profile between a depth of 6 inches and the lithic contact is dry in all parts from June 1 to October 15 and is moist in all parts from December 1 to April 30. It is slightly acid to very strongly acid. Rock fragments make up 3 to 35 percent of the profile. The profile is 10 to 27 percent clay.

The A horizon has color of 10YR 5/2, 6/2, 4/3, 5/3, 6/3, 5/4, or 6/4 or of 7.5YR 4/4, 5/4, 6/4, or 5/6. Moist color is 10YR 4/3, 4/4, or 5/3 or 7.5YR 5/2, 4/4, or 5/4.

The B2 horizon has color of 10YR 5/2, 6/2, 4/3, 5/3, 6/3, 5/4, or 6/4 or of 7.5YR 4/4, 5/4, 6/4, or 5/6. Moist color is 10YR 4/3, 4/4, 5/3, or 5/5 or 7.5YR 5/2, 4/4, or 5/4. In some pedons the horizon has a slight increase in clay content as compared to the A horizon but not enough to qualify it as an argillic horizon. This horizon is sandy loam, sandy clay loam, loam, gravelly sandy loam, gravelly sandy clay loam, or gravelly loam.

Maywood Variant

The Maywood Variant consists of very deep, well drained soils on flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Maywood Variant are coarse-loamy, mixed, nonacid, thermic Typic Xerofluvents.

Typical pedon of Maywood Variant sandy loam about 1,000 feet west of Eickoff Road, 2,150 feet north of its intersection with Scotts Valley Road; 1,500 feet north and 1,100 feet east of the southwest corner of sec. 34, T. 15 N., R. 10 W., Lakeport quadrangle.

A1—0 to 10 inches; brown (10YR 5/3) sandy loam, dark brown (10YR 4/3) moist; moderate fine, medium, and coarse angular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine and few medium roots; many very fine, fine, and medium interstitial pores and common very fine tubular pores; slightly acid; clear wavy boundary.

C1—10 to 25 inches; light brownish gray (10YR 6/2) sandy loam, dark grayish brown (10YR 4/2) moist; massive; soft, very friable, nonsticky and nonplastic; many very fine roots; many very fine and fine interstitial pores and few very fine, fine, and medium tubular pores; 10 percent pebbles 2 to 25 millimeters in diameter; slightly acid; abrupt wavy boundary.

IIC2—25 to 35 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; weak fine, medium, coarse, and very coarse angular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine roots; common very fine and fine interstitial pores and common very fine, fine, and medium tubular pores; neutral; abrupt wavy boundary.

IIC3—35 to 64 inches; pale brown (10YR 6/3) silt loam, dark yellowish brown (10YR 4/4) moist; common yellowish brown (10YR 5/8) medium and large distinct mottles; moderate medium, coarse, and very coarse prismatic structure parting to fine, medium, coarse, and very coarse subangular blocky; slightly hard, firm, slightly sticky and slightly plastic; common very fine roots; common very fine and fine interstitial pores and common very fine and medium tubular pores; neutral.

Thickness of the solum is 10 to 17 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 9 and 28 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 15. Reaction is slightly acid or neutral throughout the profile. Lenses and pockets of sand and gravel are common throughout. These soils are occasionally flooded for brief periods from November to March.

The A horizon has color of 10YR 5/3, 6/2, 6/3, or 6/4 or of 2.5YR 6/2. Moist color is 10YR 3/4, 4/2, 4/3, or 4/4.

The C horizon is similar in color to the A horizon. Mottles are present below a depth of 30 to 40 inches. The horizon is stratified silt loam, sandy loam, and loam. The particle-size control section averages 5 to 15 percent clay.

Millsholm Series

The Millsholm series consists of shallow, well drained soils on hills and mountains. These soils formed in material weathered from sandstone or shale. Slope is 8 to 50 percent.

Soils of the Millsholm series are loamy, mixed, thermic Lithic Xerochrepts.

Typical pedon of a Millsholm loam in an area of Millsholm-Bressa loams, 30 to 50 percent slopes, about 1 mile northeast of Middletown on State Highway 29, 250 feet east of the road, from a point 500 feet north of the bridge over Long Valley Creek; on Collayomi Ranch at Lat. 38°45'45' N., Long. 122°35'52' W. (in an unsectionalized area), Middletown quadrangle.

A1—0 to 9 inches; pale brown (10YR 6/3) loam, brown (10YR 4/3) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots; common fine and medium tubular pores; 5 percent subangular pebbles and few angular cobbles, mostly on the surface; medium acid; clear wavy boundary.

AB—9 to 15 inches; pale brown (10YR 6/3) clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, friable, sticky and slightly plastic; common fine roots; common fine and medium tubular pores; 10 percent subangular pebbles; slightly acid; abrupt irregular boundary.

B2t—15 to 18 inches; very pale brown (10YR 7/4) clay loam, dark yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; hard, friable, sticky and plastic; common fine roots; few fine and medium tubular pores; few thin clay films in pores; 10 percent subangular pebbles; medium acid; abrupt irregular boundary.

R—18 inches; fractured sandstone; fractures are 50 to 250 millimeters apart and as much as 12 millimeters wide; soil material and roots fill fractures.

Thickness of the solum and depth to a lithic contact are 10 to 20 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 4 and 12 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 15. Reaction is medium acid to neutral throughout the profile. Rock fragment content ranges from 0 to 20 percent; fragments are pebbles.

The A horizon has color of 10YR 6/2, 6/3, or 6/4. Moist color is 10YR 4/2, 4/3, or 4/4.

The B2t horizon has color of 7.5YR 6/3 or 6/4 or of 10YR 6/3, 6/4, or 7/4. Moist color is 7.5YR 4/2 or 4/4 or 10YR 4/3, 4/4, or 5/4. The horizon is loam, clay loam, gravelly loam, or gravelly clay loam and has 20 to 30 percent clay. The ratio of clay in the B2t horizon to that in the A horizon is 1.0 to 1.2.

Mocho Variant

The Mocho Variant consists of very deep, well drained soils on alluvial plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Mocho Variant are fine-loamy, mixed, thermic Fluventic Haploxerolls.

Typical pedon of Mocho Variant loam about 50 feet south of Butts Canyon Road, 2.5 miles east of its intersection with State Highway 29; Lat. 38°44'20' N., Long. 122°34'05' W. (in an unsectionalized area), Detert Reservoir quadrangle.

A11—0 to 6 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate fine, medium, and coarse granular structure and weak fine and medium subangular blocky; hard, friable, sticky and plastic; common very fine roots; common very fine, fine, and medium tubular pores and few very fine and fine interstitial pores; 10 percent pebbles 2 to 25 millimeters in diameter; few worm casts; slightly acid; abrupt smooth boundary.

A12—6 to 16 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; hard, very friable, sticky and plastic; common very fine roots; few very fine and fine interstitial pores and common very fine, fine, and medium tubular pores; 10 percent pebbles 2 to 50 millimeters in diameter; few worm casts; slightly acid; clear smooth boundary.

C1—16 to 28 inches; variegated grayish brown (10YR 5/2) and brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) and dark brown (10YR 3/3) moist; massive; hard, very friable, sticky and plastic; few fine roots; common very fine, fine, medium, and coarse tubular pores; 10 percent pebbles 2 to 50 millimeters in diameter; slightly acid; clear wavy boundary.

C2—28 to 40 inches; brown (10YR 5/3) clay loam, dark brown (10YR 3/3) moist; massive; hard, very friable, sticky and plastic; few very fine roots; common very fine, medium, and coarse tubular pores; 10 percent pebbles 2 to 40 millimeters in diameter; neutral; abrupt wavy boundary.

IIC3—40 to 44 inches; light brownish gray (10YR 6/2) extremely gravelly sandy clay loam, dark grayish brown (10YR 4/2) moist; massive; slightly hard, very friable, sticky and plastic; few very fine roots; few very fine and fine tubular pores; 75 percent pebbles 2 to 75 millimeters in diameter; mildly alkaline; abrupt broken boundary.

IIIC4—44 to 62 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 4/3) moist; massive; hard, firm, sticky and plastic; common very fine, fine, and medium tubular pores; 10 percent pebbles 2 to 50 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

IVC5—62 to 70 inches; pale brown (10YR 6/2) extremely gravelly sandy clay loam, brown (10YR 4/3) moist; massive; soft, very friable, sticky and plastic; common very fine, fine, and medium tubular pores; few thin clay films bridging mineral grains; few fine manganese nodules; 75 percent pebbles 2 to 75 millimeters in diameter; neutral.

Thickness of the solum is 10 to 20 inches, and depth of the profile is more than 60 inches. Mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 16 inches is dry in all parts from July 1 to September 30 and is moist in all parts from January 1 to April 15. The particle-size control section averages 25 to 35 percent clay and 5 to 15 percent pebbles. It is slightly acid to mildly alkaline and is noncalcareous.

The A horizon has color of 10YR 5/2 or 5/3. Moist color is 10YR 3/2 or 3/3. Organic matter content is 1 to 3 percent; it decreases irregularly with increasing depth and averages less than 1 percent below a depth of 20 inches. The horizon has 10 to 15 percent pebbles. It is slightly acid or neutral.

The C horizon has color of 10YR 5/2, 5/3, 6/2, or 6/3 or of 2.5YR 5/2 or 6/2. Moist color is 10YR 3/2, 3/3, 4/2, 4/3, or 4/4. The horizon is highly stratified clay loam or sandy clay loam and has 5 to 75 percent pebbles.

Montara Series

The Montara series consists of shallow, well drained soils on hills and mountains. These soils formed in material weathered from serpentinitic rock. Slope is 8 to 50 percent.

Soils of the Montara series are loamy, serpentinitic, thermic Lithic Haploxerolls.

Typical pedon of a Montara clay loam in an area of Henneke-Montara-Rock outcrop complex, 15 to 50 percent slopes, about 1.5 miles north on a ranch road from the entrance to the Diamond D Ranch then 10 feet west of the road along Putah Creek; Lat. 38°46'40' N., Long. 122°36'20' W. (in an unsectionalized area), Middletown quadrangle.

A11—0 to 6 inches; grayish brown (10YR 5/2) clay loam, very dark gray (10YR 3/1) moist; moderate very fine and fine granular structure; slightly hard, very friable, sticky and plastic; many very fine and fine roots; common fine tubular pores; 10 percent weathered angular serpentinite pebbles; mildly alkaline; clear wavy boundary.

A12—6 to 12 inches; grayish brown (2.5YR 5/2) clay loam, very dark grayish brown (2.5YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; common

fine tubular pores; few thin clay films bridging mineral grains and in pores; 10 percent weathered angular serpentinite pebbles; mildly alkaline; abrupt irregular boundary.

R—12 to 18 inches; hard, fractured serpentinite; fractures 25 millimeters apart and 1 millimeter wide; few fine roots in fractures.

Depth to a lithic contact is 10 to 20 inches. The mean annual soil temperature is 59 to 64 degrees F. The part of the profile below a depth of about 4 inches is dry in all parts from June 1 to October 30 and is moist in all parts from December 1 to April 30. Rock fragment content ranges from 5 to 35 percent but commonly is less than 15 percent. Reaction is neutral to moderately alkaline. The calcium to magnesium ratio is 1:1 to 1:10.

The A horizon has color of 10YR or 2.5YR 5/1 or 5/2. Moist color is 10YR 3/1, 3/2, or 3/3 or 2.5YR 3/2.

Some pedons have a thin C horizon.

Neice Series

The Neice series consists of very deep, well drained soils on hills. These soils formed in material weathered from metavolcanic rock. Slope is 15 to 75 percent.

Soils of the Neice series are clayey-skeletal, montmorillonitic, thermic Mollic Palexeralfs.

Typical pedon of a Neice gravelly loam in an area of Neice-Sobrante-Hambright complex, 15 to 30 percent slopes, about 1.2 miles north on Pyle Road from its intersection with State Highway 20 and then 100 feet west of road; 1,750 feet west and 250 feet south of the northeast corner of sec. 21, T. 15 N., R. 9 W., Bartlett Mountain quadrangle.

A11—0 to 2 inches; yellowish red (5YR 4/6) gravelly loam, dark reddish brown (5YR 3/4) moist; moderate fine, medium, and coarse granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and fine interstitial pores; 30 percent pebbles 2 to 30 millimeters in diameter; neutral; clear wavy boundary.

A12—2 to 11 inches; yellowish red (5YR 5/6) gravelly loam, dark reddish brown (5YR 3/4) moist; weak coarse and very coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine and medium roots; many very fine and few fine tubular pores; very few thin clay films in pores; 30 percent pebbles 2 to 30 millimeters in diameter; neutral; clear wavy boundary.

B21t—11 to 20 inches; yellowish red (5YR 4/6) gravelly clay loam, dark reddish brown (2.5YR 3/4) moist; massive; slightly hard, friable, sticky and plastic; common very fine roots and few fine and medium roots; common very fine tubular pores; few thin clay films on peds and in pores; 30 percent pebbles 2 to 50 millimeters in diameter; neutral; clear smooth boundary.

B22t—20 to 34 inches; dark red (2.5YR 3/6) very gravelly clay, dark red (2.5YR 3/6) moist; massive; hard, friable, sticky and plastic; few very fine, fine, medium, and coarse roots; common very fine tubular pores; common moderately thick clay films in pores; 40 percent pebbles 2 to 75 millimeters in diameter; neutral; gradual smooth boundary.

B23t—34 to 70 inches; dark red (2.5YR 3/6) very gravelly clay, dark red (2.5YR 3/6) moist; massive; hard, friable, sticky and plastic; few very fine roots; few very fine tubular pores; many moderately thick clay films bridging mineral grains and in pores; 40 percent pebbles 2 to 75 millimeters in diameter; neutral.

Thickness of solum and depth of the profile are more than 60 inches. Mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 11 and 29 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 30. The particle-size control section averages 35 to 50 percent clay and 35 to 60 percent rock fragments. Clay content does not decrease by as much as 20 percent of its maximum within a depth of 60 to 70 inches.

The A horizon has color of 7.5YR 4/4 or 5/4 or of 5YR 4/3, 4/4, 4/6, 5/4, 5/6, 6/4, or 6/6. Moist color is 7.5YR 3/4 or 4/4; 5YR 3/3, 3/4, or 4/4; or 2.5YR 3/4 or 3/6. Moist value is 3.5 or less in the upper 4 to 12 inches. Organic matter content is 0.25 to 1.0 percent below a depth of 8 inches.

The B2t horizon has color of 5YR 4/4, 4/6, 5/4, or 5/8 or of 2.5YR 3/4, 3/6, 4/4, 4/6, or 5/6. Moist color is 5YR 3/4 or 4/4 or 2.5YR 3/4, 3/6, 4/6, or 4/8. In some pedons this horizon is variegated. It is gravelly clay loam, very gravelly clay loam, or very gravelly clay and has 27 to 55 percent clay and 30 to 55 percent rock fragments consisting of pebbles and cobbles.

Neuns Series

The Neuns series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from sandstone, metamorphosed sandstone, or greenstone. Slope is 15 to 75 percent.

Soils of the Neuns series are loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical pedon of a Neuns gravelly loam in an area of Neuns-Sanhedrin-Speaker gravelly loams, 30 to 50 percent slopes, in Mendocino National Forest, about 600 feet east of gate on Long Valley Ridge Road; 1,700 feet north and 100 feet east of the southwest corner of sec. 21, T. 15 N., R. 8 W., Bartlett Mountain quadrangle.

O1 and O2—1.5 inches to 0; undecomposed and partially decomposed needles, leaves, twigs, and bark.

A1—0 to 4 inches; light yellowish brown (10YR 6/4) and brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure parting to moderate very fine and fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine, fine, and medium interstitial pores and common very fine and fine tubular pores; 25 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 125 millimeters in diameter; medium acid; clear smooth boundary.

B1—4 to 14 inches; pale brown (10YR 6/3) very gravelly loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure and moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and common coarse roots; many very fine, fine, and medium interstitial pores and common very fine and fine tubular pores; 30 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 125 millimeters in diameter; medium acid; clear wavy boundary.

B2—14 to 31 inches; reddish yellow (7.5YR 6/6) very gravelly loam, strong brown (7.5YR 4/6) moist; moderate fine, medium, and coarse subangular blocky structure and moderate very fine and fine granular; slightly hard, friable, slightly sticky and slightly plastic; common fine, medium, and coarse roots; common very fine, fine, and medium interstitial pores and many very fine, fine, and medium tubular pores; 35 percent pebbles 2 to 75 millimeters in diameter and 15 percent cobbles 75 to 125 millimeters in diameter; medium acid; clear wavy boundary.

R—31 inches; hard, fractured sandstone with some soil material in the fractures; fractures as much as 5 millimeters wide and 50 to 130 millimeters apart.

Depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature is 47 to 53 degrees F. The part of the profile between depths of 10 and 28 inches is dry in all parts from July 1 to October 30 and moist in all parts from December 1 to April 30. The particle-size control section averages 8 to 18 percent clay and 35 to 60 percent rock fragments. Base saturation below a depth of 10 inches is 40 to 60 percent. Reaction is slightly acid or medium acid.

The A horizon has color of 7.5YR 5/2, 5/4, or 6/2 or of 10YR 5/3, 6/2, 6/3, or 6/4. Moist color is 7.5YR 3/2 or 10YR 3/2, 3/3, 4/2, or 4/3. Only the upper 2 to 6 inches of the horizon has moist value of 3.5 or less.

The B horizon has value of 7.5YR 5/4, 6/4, or 6/6 or of 10YR 6/3, 6/4, or 7/4. Moist color is 7.5YR 4/4, 4/6, or 5/4 or 10YR 4/3, 4/4, or 5/4. The horizon is very gravelly sandy loam or very gravelly loam and has 1 to 2 percent more clay than does the A horizon.

Some pedons have a C horizon that has 35 to 60 percent rock fragments.

Okiota Series

The Okiota series consists of shallow, well drained soils on hills and mountains. These soils formed in material weathered from serpentinitic rock. Slope is 5 to 50 percent.

Soils of the Okiota series are clayey, serpentinitic, thermic Lithic Argixerolls.

Typical pedon of an Okiota very gravelly clay loam in an area of Okiota-Henneke complex, 5 to 30 percent slopes, on Jerusalem Road, about 5.7 miles east of its intersection with Spruce Grove Road; 2,750 feet north and 1,825 feet east of the southwest corner of sec. 18, T. 11 N., R. 5 W., Jericho Valley quadrangle.

A11—0 to 1 inch; reddish brown (5YR 4/4) very gravelly clay loam, dark reddish brown (5YR 3/3) moist; moderate medium and coarse subangular blocky structure parting to weak medium platy; slightly hard, friable, sticky and plastic; few fine and medium roots; common fine and medium interstitial pores; 30 percent pebbles 2 to 75 millimeters in diameter and 15 percent cobbles 75 to 200 millimeters in diameter; rock fragments are rounded or subrounded and about 20 percent of the rock surfaces are imbedded into this layer; neutral; abrupt wavy boundary.

A12—1 inch to 3 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/3) moist; moderate medium and coarse subangular blocky structure parting to weak medium platy; hard, firm, sticky and plastic; few fine, medium, and coarse roots; common fine and medium interstitial pores; 10 percent pebbles 2 to 25 millimeters in diameter; neutral; abrupt wavy boundary.

B21t—3 to 5 inches; dark reddish brown (5YR 3/3) clay, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure parting to strong fine granular; hard, firm, very sticky and very plastic; few fine and medium roots; many fine and medium interstitial pores; common moderately thick clay films on peds and in pores; 10 percent pebbles 2 to 25 millimeters in diameter; neutral; abrupt wavy boundary.

B22t—5 to 14 inches; dark reddish brown (5YR 3/4) clay, dark reddish brown (5YR 3/3) moist; strong medium and coarse subangular blocky structure; very hard, very firm, very sticky and very plastic; few very fine and fine roots; common very fine and fine interstitial pores; 10 percent pebbles 2 to 75 millimeters in diameter; common moderately thick

clay films on peds and in pores; neutral; abrupt irregular boundary.
R—14 inches; hard, fractured, slightly weathered, serptentinitic rock; fractures 2 to 10 millimeters wide and 30 to 100 millimeters apart; few medium roots in fractures.

Thickness of the solum and depth to a lithic contact are 10 to 20 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 7 and 14 inches is dry from July 1 to October 15 and is moist from December 1 to April 15. Calcium to magnesium ratio is 1:1 to 1:10.

The A horizon has color of 7.5YR or 5YR 3/2, 3/4, or 4/4. Moist color is 7.5YR or 5YR 3/2 or 3/3. Content of pebbles ranges from 5 to 50 percent, and content of cobbles ranges from 0 to 15 percent. Rock fragments commonly are concentrated at or near the surface. The horizon is neutral or mildly alkaline. Organic carbon content is 1 to 3 percent.

The B2t horizon has color of 5YR 3/4, 4/4, or 5/4. Moist color is 5YR 3/2, 3/3, 3/4, or 4/4. The horizon is clay and has 40 to 55 percent clay. Content of pebbles ranges from 0 to 10 percent, and content of cobbles ranges from 0 to 5 percent. The horizon is neutral or mildly alkaline.

Oxalis Variant

The Oxalis Variant consists of very deep, poorly drained soils on alluvial plains. These soils formed in alluvium derived from volcanic sources. Slope is 0 to 2 percent.

Soils of the Oxalis Variant are fine, montmorillonitic, thermic Vertic Xerochrepts.

Typical pedon of Oxalis Variant silt loam (fig. 7) on Manning Flat, 2,250 feet south and 1,400 feet east of the northwest corner of sec. 1, T. 12 N., R. 8 W., Clearlake Highlands quadrangle.

A11—0 to 3 inches; light brownish gray (10YR 6/2) silt loam, dark gray (10YR 4/1) moist; weak medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine tubular pores; medium acid; clear wavy boundary.
A12—3 to 8 inches; gray (10YR 6/1) silt loam, dark gray (10YR 4/1) moist; few fine faint yellowish red (5YR 5/8) mottles, reddish brown (5YR 5/4) moist; weak fine, medium, and coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; many very fine roots; common very fine tubular pores; strongly acid; clear wavy boundary.
B1—8 to 17 inches; light gray (10YR 7/2) silty clay loam, dark gray (10YR 4/1) moist; common fine faint yellowish red (5YR 5/8) and reddish yellow (5YR 6/6) mottles, reddish brown (5YR 5/4) and light reddish brown (5YR 6/4) moist; moderate fine and

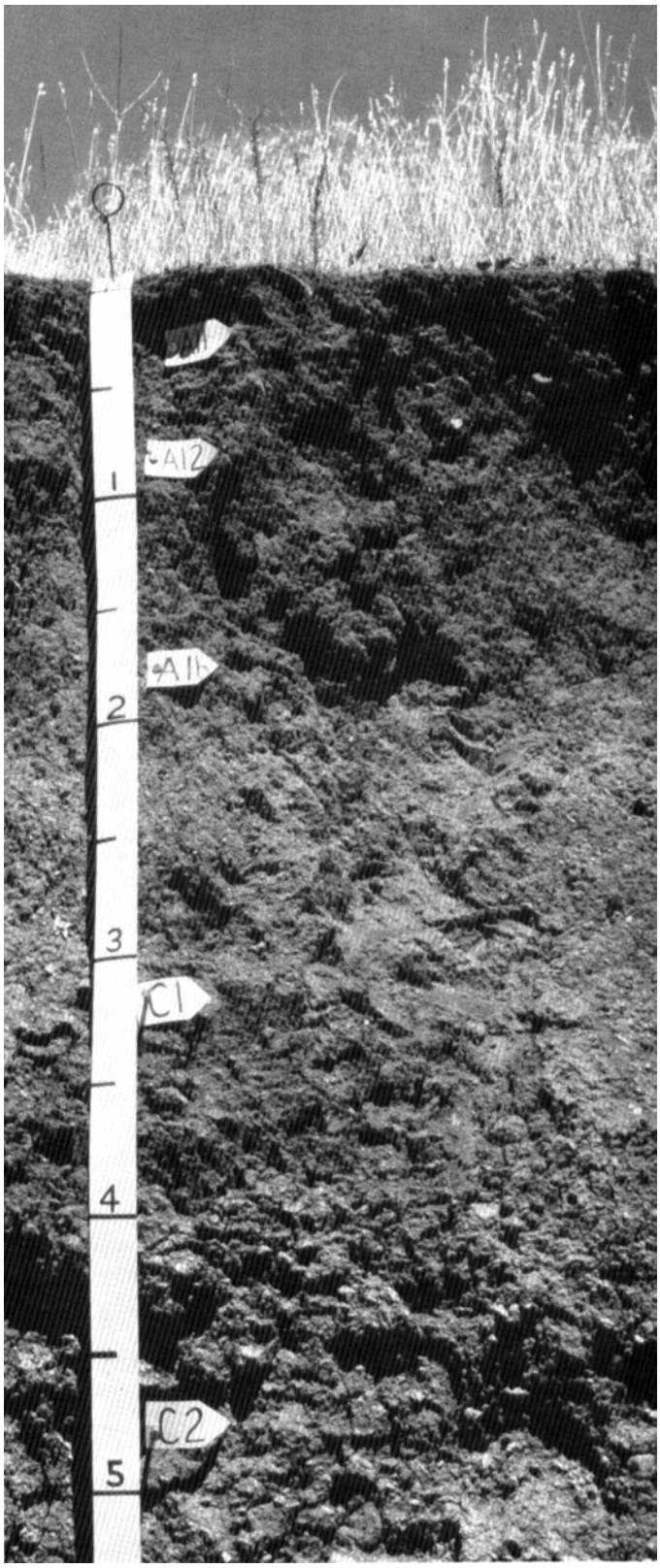

Figure 7.—Profile of Oxalis Variant silt loam.

medium prismatic structure; hard, firm, sticky and plastic; common very fine roots; common fine tubular pores; medium acid; clear irregular boundary.

A1b—17 to 23 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; common fine and medium distinct yellowish red (5YR 5/8) and reddish yellow (7.5YR 6/6) mottles, reddish brown (5YR 5/4) and light brown (7.5YR 6/4) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine tubular pores; slightly acid; clear irregular boundary.

B2bt—23 to 70 inches; light gray (10YR 7/2) silty clay, dark gray (10YR 4/1) moist; common fine and medium distinct yellowish red (5YR 5/8) and reddish yellow (7.5YR 6/6) mottles, reddish brown (5YR 5/4) and light brown (7.5YR 6/4) moist; weak medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine roots; common medium tubular pores; few thin clay films in pores; dark organic stains in pores; neutral; clear wavy boundary.

C—70 to 84 inches; white (2.5Y 8/2) silt loam, light gray (2.5Y 7/2) moist; common fine and medium prominent yellowish brown (10YR 5/8) mottles; strong brown (7.5YR 5/8) moist; massive; hard, friable, slightly sticky and slightly plastic; few fine interstitial pores; dark organic stains throughout; strongly alkaline.

Depth of the profile is 70 to 120 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 19 inches is dry in all parts from July 1 to October 30 and is moist in all parts from December 1 to April 15. Cracks open and close once a year. Cracks 10 to 15 millimeters wide extend to a depth of 30 inches and are 6 to 12 inches apart.

The A horizon has color of 7.5YR 7/4, of 10YR 5/1, 6/1, 6/2, or 7/2, or of 2.5Y 5/2. Moist color is 10YR 3/1, 3/2, 4/1, or 4/2. Mottles have color of 5YR 4/8, 5/4, 5/8, or 6/6 or 10YR 6/2. The horizon is strongly acid to neutral.

The B horizon has color of 10YR 6/2 or 7/2 or of 2.5Y 5/2 or 6/2. Moist color is 10YR 4/1 or 4/2 or 2.5Y 4/2. Mottles have color of 5YR, 7.5YR, or 10YR 5/6, 5/8, 6/8, 6/6, or 7/2. The horizon is silty clay loam or silty clay. The particle-size control section averages 35 to 50 percent clay. It is medium acid to neutral. In some pedons a thin ash layer is present between depths of 13 and 17 inches.

The C horizon has color of 2.5Y 6/2, 7/2, or 8/2 when dry or moist. Mottles have color of 5YR or 10YR 5/6 or 5/8. The horizon is sandy clay loam, silty clay loam, or silt loam. It is mildly alkaline to strongly alkaline and is noncalcareous.

Phipps Series

The Phipps series consists of very deep, well drained soils on uplifted and dissected hills. These soils formed in alluvium derived from mixed sources. Slope is 2 to 50 percent.

Soils of the Phipps series are fine, mixed, thermic Mollic Haploxeralfs.

Typical pedon of a Phipps loam in an area of Bally-Phipps complex, 15 to 30 percent slopes, about 2 miles east of Clearlake Highlands, 0.5 mile southeast of Lake County landfill, along Bureau of Land Management access road, and 100 feet east of road; 25 feet south and 800 feet east of the northwest corner of sec. 25, T. 13 N., R. 7 W., Lower Lake quadrangle.

O2—0.5 inch to 0; discontinuous layer of decomposed organic material.

A1—0 to 6 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; moderate coarse and very coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium and coarse roots; common fine and medium interstitial pores and few fine and medium tubular pores; 10 percent rounded pebbles; neutral; abrupt wavy boundary.

B21t—6 to 15 inches; brown (7.5YR 5/4) gravelly clay loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine roots and few fine and medium roots; common very fine and fine interstitial pores and few very fine and fine tubular pores; many moderately thick and thick clay films on peds and bridging mineral grains; 20 percent rounded pebbles; slightly acid; clear wavy boundary.

B22t—15 to 21 inches; brown (7.5YR 5/4) gravelly clay loam, strong brown (7.5YR 5/6) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots and few fine and medium roots; common very fine interstitial pores and few very fine tubular pores; many moderately thick clay films on peds; 28 percent rounded pebbles; slightly acid; clear wavy boundary.

C1—21 to 41 inches; brown (7.5YR 5/4) gravelly sandy clay loam, dark yellowish brown (10YR 4/6) moist; massive; hard, firm, sticky and plastic; few very fine and fine roots; few very fine tubular and interstitial pores; many moderately thick clay films on rock fragments; 30 percent rounded pebbles; neutral; gradual wavy boundary.

C2—41 to 73 inches; yellowish brown (10YR 5/4) very gravelly sandy clay loam, yellowish brown (10YR 5/6) moist; massive; hard, firm, sticky and plastic; few very fine and fine tubular and interstitial pores; many moderately thick clay films on rock fragments;

45 percent rounded pebbles and 2 percent cobbles; slightly acid.

Thickness of the solum is 20 to 45 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 7 and 23 inches is dry in all parts from July 1 to October 1 and is moist in all parts from January 1 to April 30. Reaction is neutral or slightly acid throughout the profile. The particle-size control section commonly is 35 to 50 percent clay and 5 to 35 percent rock fragments consisting of pebbles and cobbles.

The A horizon has color of 7.5YR 5/3 or 5/4, of 10YR 5/3, 6/2, or 6/3, or of 2.5Y 6/2. Moist color is 7.5YR 3/2 or 3/4 or 10YR 3/3 or 3/4. Organic matter content is 0.25 to 1.0 percent below a depth of 6 inches. The horizon is loam, clay loam, or gravelly loam and is 15 to 35 percent clay.

The B2t horizon has color of 7.5YR 4/4 or 5/4, of 10YR 4/3, 5/4, 6/3, 6/4, or 7/2, or of 2.5Y 6/2. Moist color is 7.5YR 3/4, 4/4, 4/6, or 5/6 or 10YR 3/3, 3/4, 4/3, 4/4, 5/2, 5/3, 6/2, or 6/3. The horizon is clay loam, gravelly clay loam, clay, or gravelly clay.

The C horizon has color of 7.5YR 5/4 or of 10YR 5/4 or 6/4. Moist color is 10YR 4/6 or 5/6. The horizon is clay loam, gravelly clay loam, very gravelly clay loam, gravelly sandy clay loam, very gravelly sandy clay loam, gravelly clay, gravelly loam, or very gravelly loam.

Pomo Series

The Pomo series consists of deep, well drained soils on hills and mountains. These soils formed in material weathered from sandstone, shale, or graywacke. Slope is 15 to 50 percent.

Soils of the Pomo series are fine-loamy, mixed, thermic Typic Haploxeralfs.

Typical pedon of a Pomo loam in an area of Pomo-Bressa loams, 15 to 50 percent slopes, on Middle Mountain, about 1.6 miles east-northeast of Hunter Point; 1,100 feet south and 400 feet east of the northwest corner of sec. 28, T. 16 N., R. 10 W., Upper Lake quadrangle.

A11—0 to 1 inch; yellowish brown (10YR 5/4) loam, dark brown (10YR 3/3) moist; moderate medium granular structure; soft, very friable, slightly sticky and nonplastic; many very fine and fine roots; many fine and medium interstitial pores; 3 percent pebbles 2 to 25 millimeters in diameter; neutral; abrupt wavy boundary.

A12—1 inch to 11 inches; yellowish brown (10YR 5/4) loam, dark yellowish brown (10YR 4/4) moist; moderate medium, coarse, and very coarse prismatic structure parting to moderate coarse and very coarse angular blocky; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine, common medium, and few coarse tubular pores; 7 percent pebbles 2 to 50 millimeters in diameter; neutral; abrupt wavy boundary.

B1—11 to 20 inches; yellowish brown (10YR 5/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine roots; many very fine and fine and common medium tubular and interstitial pores; 15 percent pebbles 2 to 75 millimeters in diameter; neutral; clear wavy boundary.

B21t—20 to 28 inches; dark yellowish brown (10YR 4/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine and few fine and medium tubular pores and common fine interstitial pores; few thin clay films on peds and in pores; 15 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 150 millimeters in diameter; neutral; gradual wavy boundary.

B22t—28 to 40 inches; dark yellowish brown (10YR 3/4) gravelly loam, dark yellowish brown (10YR 3/6) moist; weak fine and medium subangular blocky structure; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; many very fine and few medium and coarse tubular pores and many very fine and fine interstitial pores; few thin clay films on peds and in pores; 15 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 150 millimeters in diameter; neutral; gradual wavy boundary.

C—40 to 58 inches; dark yellowish brown (10YR 3/4) very gravelly clay loam, dark yellowish brown (10YR 3/6) moist; massive; hard, friable, sticky and slightly plastic; few very fine roots; many very fine tubular and interstitial pores; common thin clay films on rock fragments; 50 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 150 millimeters in diameter; neutral; clear wavy boundary.

IIR—58 inches; weathered, fractured sandstone; fractures are 75 to 250 millimeters apart both horizontally and vertically and are 0 to 25 millimeters wide.

Depth to a lithic contact is 40 to 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 7 and 21 inches is dry in all parts from June 15 to September 15 and is moist in all parts from January 1 to April 15. Most pedons are neutral throughout, but some range to medium acid in the lower part of the profile.

The A horizon has color of 7.5YR 5/4 or 10YR 5/3 or 5/4. Moist color is dominantly 7.5YR 4/4 or 10YR 4/3 or 4/4. The upper 1 to 2 inches commonly has moist color of 10YR 3/2 or 3/3.

Some pedons do not have a B1 horizon. The B2t horizon has color of 7.5YR or 10YR 4/4 or 5/4 or of 10YR 3/4. Moist color is 7.5YR or 10YR 3/4, 3/6, 4/4, or 5/4. It is gravelly loam or gravelly clay loam and has 15 to 35 percent pebbles and 2 to 10 percent cobbles. Base saturation (sum of cations) is 75 to 90 percent. Clay content is 25 to 35 percent.

The C horizon is similar in color to the B2t horizon. It is gravelly clay or very gravelly clay loam and has 30 to 50 percent clay. Rock fragment content is 20 to 60 percent; fragments are pebbles and cobbles.

Sanhedrin Series

The Sanhedrin series consists of deep, well drained soils on mountains. These soils formed in material weathered from sandstone or shale. Slope is 5 to 75 percent.

Soils of the Sanhedrin series are fine-loamy, mixed, mesic Ultic Haploxeralfs.

Typical pedon of a Sanhedrin gravelly loam in an area of Neuns-Sanhedrin-Speaker gravelly loams, 30 to 50 percent slopes, about 3,000 feet east on Long Valley Ridge Road from its intersection with Bartlett Springs Road, and then about 600 feet south; 1,300 feet north and 100 feet west of southeast corner of sec. 20, T. 15 N., R. 8 W., Bartlett Mountain quadrangle.

O1 and O2—2 inches to 0; layer of partially decomposed and decomposed conifer needles, leaves, twigs, and bark.

A11—0 to 4 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure parting to moderate very fine and fine granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots and few medium roots; many very fine and fine tubular and interstitial pores; 25 percent pebbles 2 to 25 millimeters in diameter; medium acid; clear smooth boundary.

A12—4 to 8 inches; pale brown (10YR 6/3) gravelly loam, dark brown (10YR 3/3) moist; weak fine and medium subangular blocky structure parting to moderate very fine and fine granular; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; 20 percent pebbles 2 to 25 millimeters in diameter; medium acid; clear smooth boundary.

B1—8 to 19 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure parting to moderate very fine and fine granular; soft, friable, sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium tubular and interstitial pores; 20 percent pebbles 2 to 25 millimeters in diameter; medium acid; clear wavy boundary.

B21t—19 to 29 inches; reddish yellow (7.5YR 6/6) gravelly loam, dark brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure; slightly hard, firm, sticky and slightly plastic; common very fine and fine tubular and interstitial pores; common thin and few moderately thick clay films on peds and in pores; 20 percent pebbles 2 to 25 millimeters in diameter; medium acid; gradual smooth boundary.

B22t—29 to 41 inches; reddish yellow (7.5YR 6/6) gravelly loam, dark brown (7.5YR 4/4) moist; moderate very fine, fine, and medium subangular blocky structure; slightly hard, firm, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine and fine tubular and interstitial pores; common thin and moderately thick clay films on peds and in pores; 20 percent pebbles 2 to 25 millimeters in diameter; medium acid: gradual smooth boundary.

B23t—41 to 57 inches; reddish yellow (7.5YR 6/6) gravelly clay loam, brown (7.5YR 5/4) moist; moderate very fine, fine, and medium subangular blocky structure; slightly hard, firm, sticky and slightly plastic; few very fine and fine roots; common very fine tubular pores; common moderately thick clay films on peds and in pores; 25 percent pebbles 2 to 25 millimeters in diameter; strongly acid; clear smooth boundary.

R—57 to 60 inches; hard, fractured sandstone; fractures are 1 to 5 millimeters wide and 25 to 150 millimeters apart.

Thickness of the solum and depth to a lithic contact are 40 to 60 inches. The mean annual soil temperature is 50 to 54 degrees F. The part of the profile between depths of 8 and 24 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 30. Rock fragment content ranges from 15 to 35 percent; fragments are pebbles and cobbles.

The A horizon has color of 10YR 4/2, 4/3, 5/2, 5/3, 5/4, or 6/3 or of 7.5YR 5/2. Moist color is 10YR 3/2 or 3/3 or 7.5YR 3/3. Organic matter content is 0.25 to 1.0 percent below a depth of 8 inches. Reaction is slightly acid or medium acid.

The B2t horizon has color of 10YR 5/4, 5/6, or 6/4, of 7.5YR 5/4, 5/6, 6/4, 6/6, or 7/6, or of 5YR 4/6, 5/6, 6/4, or 6/6. Moist color is 10YR 3/4 or 5/4; 7.5YR 3/4, 4/4, 4/6, 5/4, 5/6, or 6/6; or 5YR 4/4, 4/6, or 5/6. The horizon is gravelly loam or gravelly clay loam that is 25 to 35 percent clay. Reaction is slightly acid to strongly acid.

San Joaquin Variant

The San Joaquin Variant consists of moderately deep, well drained soils on alluvial plains and stream terraces. These soils formed in alluvium derived from volcanic rock. Slope is 0 to 5 percent.

Soils of the San Joaquin Variant are fine, mixed, thermic Abruptic Durixeralfs.

Typical pedon of San Joaquin Variant fine sandy loam, 0 to 5 percent slopes, about 3,875 feet east on Konocti Road from its intersection with State Highway 29, then about 600 feet north of road; 2,050 feet south and 125 feet east of the northwest corner of sec. 13, T. 13 N., R. 9 W., Kelseyville quadrangle.

Ap—0 to 10 inches; light gray (10YR 7/2) fine sandy loam, dark grayish brown (10YR 4/2) moist; moderate coarse and very coarse subangular blocky structure; slightly hard, very friable, nonsticky and nonplastic; many very fine roots; few very fine and fine interstitial pores and common very fine and fine tubular pores; medium acid; clear wavy boundary.

A12—10 to 16 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; common very fine and fine roots; few very fine and fine interstitial pores and common very fine and fine tubular pores; slightly acid; clear wavy boundary.

A3—16 to 21 inches; light gray (10YR 7/2) fine sandy loam, grayish brown (10YR 5/2) moist; massive; slightly hard, very friable, slightly sticky and slightly plastic; few very fine roots; few very fine interstitial pores and many fine and medium tubular pores; many pressure faces; slightly acid; abrupt wavy boundary.

B2t—21 to 25 inches; light brownish gray (10YR 6/2) clay loam, dark grayish brown (10YR 4/2) moist; strong medium prismatic structure; very hard, very firm, sticky and very plastic; few very fine roots; few very fine, fine, and medium interstitial pores and common very fine tubular pores; common moderately thick clay films on peds; very strongly acid; abrupt wavy boundary.

C1sim—25 to 30 inches; pale brown (10YR 6/3) silica-cemented duripan, dark brown (10YR 4/3) moist; vertical cracks 25 to 75 millimeters long and 5 to 10 millimeters wide; continuous thick clay films on fracture faces; medium acid; abrupt wavy boundary.

IIC2—30 to 51 inches; pale brown (10YR 6/3) sandy loam, dark brown (10YR 4/3) moist; massive; very hard, very firm, nonsticky and nonplastic; few very fine interstitial pores and common very fine and fine tubular pores; few moderately thick clay films in pores; mildly alkaline; abrupt wavy boundary.

IIIC3—51 to 65 inches; pale brown (10YR 6/3) fine sandy loam, dark brown (10YR 4/3) moist; common fine and medium prominent black (10YR 2/1) mottles; moderate medium, coarse, and very coarse platy structure; very hard, very firm, slightly sticky and slightly plastic; few very fine interstitial pores and common very fine and fine tubular pores; few thin clay films on peds and in pores; random manganese oxide stains; moderately alkaline.

Depth to the duripan is 20 to 40 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 7 and 22 inches is dry in all parts from June 1 to October 15 and is moist in all parts from December 1 to April 15. Some pedons have vitric fragments on the surface and in the A horizon. The boundary is abrupt between either the A3 horizon and B2t horizon or the B1 horizon and B2t horizon. The duripan has color of 10YR 6/2 or 6/3. Moist color is 10YR 4/2 or 4/3. The duripan is 3 to 8 inches thick and has fractures 2 to 15 millimeters wide and 25 to 100 millimeters apart.

The A horizon has color of 10YR 6/2, 7/2, or 8/1. Moist color is 10YR 4/2, 5/2, or 5/4. The horizon is slightly acid to strongly acid.

The B2t horizon has color of 10YR 5/2 or 6/2 or of 2.5Y 6/2. Moist color is 10YR 4/2, 4/4, or 5/2. The horizon is clay loam or clay and has 35 to 50 percent clay. It is slightly acid to very strongly acid.

The C horizon below the duripan has color of 10YR 6/2, 6/3, or 7/2 or of 2.5Y 7/2. Moist color is 10YR 4/2, 4/3, or 5/2 or 2.5Y 4/4. The horizon is stratified loamy sand, sandy loam, fine sandy loam, clay loam, or sandy clay loam. It is slightly acid or moderately alkaline.

Sheetiron Series

The Sheetiron series consists of moderately deep, well drained soils on mountains. These soils formed in material derived from mica-quartz schist. Slope is 30 to 75 percent.

Soils of the Sheetiron series are loamy-skeletal, mixed, mesic Dystric Xerochrepts.

Typical pedon of a Sheetiron gravelly sandy loam in an area of Sheetiron-Deadwood association, 30 to 50 percent slopes, in Mendocino National Forest, 0.9 miles east on Road 20N02 from its intersection with Road 20N11 and then 0.3 mile north on logging road; 1,850 feet north and 2,000 feet east of the southwest corner of sec. 23, T. 20 N., R. 9 W., Kneecap Ridge quadrangle.

O1—1 inch to 0; decomposed and partially decomposed conifer litter consisting of twigs, bark, needles, and cones.

A11—0 to 3 inches; brown (10YR 5/3) gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium roots; many

very fine, fine, and medium interstitial pores; 30 percent pebbles 2 to 75 millimeters in diameter; strongly acid; clear wavy boundary.

A12—3 to 8 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 4/3) moist; moderate very fine and fine granular structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common coarse roots; common very fine, fine, and medium interstitial pores; few thin mica and silt coatings on peds and in pores; 50 percent pebbles 2 to 75 millimeters in diameter; strongly acid; clear wavy boundary.

B21—8 to 17 inches; pale brown (10YR 6/3) very gravelly sandy loam, brown (10YR 5/3) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine and fine roots, many medium roots, and common coarse roots; common very fine, fine, and medium interstitial pores; common moderately thick mica and silt coatings on peds and in pores; 50 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 125 millimeters in diameter; strongly acid; gradual wavy boundary.

B22—17 to 29 inches; very pale brown (10YR 7/3) extremely gravelly sandy loam, yellowish brown (10YR 5/4) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and nonplastic; common very fine, fine, and medium roots and few coarse roots; common very fine, fine, and medium interstitial pores; common moderately thick mica and silt coatings on peds and in pores; 55 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 125 millimeters in diameter; strongly acid; abrupt irregular boundary.

R—29 inches; hard, fractured mica-quartz schist; fractures are 1 to 10 millimeters wide and 25 to 100 millimeters apart; soil material and roots extend down into the fractures.

Depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature is 47 to 54 degrees F. The part of the profile between depths of 9 and 29 inches is moist in all parts from December 1 to April 30 and is dry in all parts from July 1 to October 1. Base saturation is 40 to 60 percent throughout. The clay mineral fraction is high in chlorite and mica, but not enough for the micaceous mineralogy class. Reaction is strongly acid or medium acid throughout the profile.

The A horizon has color of 10YR 5/3, 5/4, 6/3, 6/4, or 7/3. Moist color is 10YR 3/2, 3/3, 4/3, 4/4, or 5/3. Dry value of 5 or less and moist value and chroma of 3 or less occur only in the upper 3 to 6 inches. The horizon has 18 to 25 percent clay and 20 to 50 percent pebbles and cobbles.

The B2 horizon has color of 10YR 6/2, 6/3, 7/2, or 7/3. Moist color is 10YR 5/3 or 5/4 or 2.5YR 5/3 or 5/4. The horizon is loam or sandy loam and has 18 to 25 percent clay. It is very gravelly or extremely gravelly and has 35 to 70 percent pebbles and cobbles.

Shortyork Variant

The Shortyork Variant consists of moderately deep, well drained soils on hills and mountains. These soils formed in material derived from greenstone and metamorphosed sandstone. Slope is 15 to 50 percent.

Soils of the Shortyork Variant are clayey-skeletal, mixed, thermic Ultic Argixerolls.

Typical pedon of a Shortyork Variant gravelly loam in an area of Shortyork Variant-Yorkville-Squawrock association, 15 to 50 percent slopes, in Mendocino National Forest, about 1.2 miles northeast on Road 17N33 from Snow Mountain House; 1,650 feet north and 850 feet east of southwest corner of sec. 5, T. 17 N., R. 8 W., Potato Hill quadrangle.

A11—0 to 2 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; strong fine and medium granular structure; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine interstitial pores; 30 percent pebbles 2 to 25 millimeters in diameter; neutral; clear smooth boundary.

A12—2 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark brown (10YR 2/2) moist; moderate fine subangular blocky structure parting to weak fine granular; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine interstitial pores; 30 percent pebbles 2 to 50 millimeters in diameter; neutral; clear wavy boundary.

B21t—9 to 12 inches; grayish brown (10YR 5/2) very gravelly clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and medium roots; many very fine and fine interstitial pores; common thin and moderately thick clay films on peds and in pores; 40 percent pebbles 2 to 75 millimeters in diameter and 5 percent cobbles 75 to 250 millimeters in diameter; neutral; clear wavy boundary.

B22t—12 to 17 inches; variegated brown and light olive brown (10YR 5/3, 2.5Y 5/4) very gravelly clay, variegated dark grayish brown (2.5Y 4/2) and dark brown (10YR 3/3) moist; moderate fine and medium roots; common very fine and fine interstitial pores; many moderately thick clay films on peds and in pores; 45 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 250 millimeters in diameter; slightly acid; gradual wavy boundary.

B23t—17 to 32 inches; variegated brown and light olive brown (10YR 5/3, 2.5Y 5/4) very gravelly clay, variegated dark grayish brown and dark yellowish brown (2.5Y 4/2, 10YR 4/4) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and very plastic; few fine and medium roots; common very fine and fine interstitial pores; many moderately thick and thick clay films on peds and in pores; 45 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 250 millimeters in diameter; slightly acid; clear wavy boundary.

R—32 inches; fractured greenstone and metamorphosed sandstone; fractures are 5 to 15 millimeters wide and 25 to 75 millimeters apart.

The thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 10 and 27 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 15. Base saturation is 50 to 75 percent throughout the profile.

The A horizon has color of 10YR 4/2, 5/1, 5/2, or 5/3 or of 2.5Y 5/2. Moist color is 10YR 2/2, 3/1, or 3/2 or 2.5Y 3/2. Content of rock fragments ranges from 15 to 35 percent; fragments are pebbles. Reaction is slightly acid or neutral.

The B2t horizon has color of 10YR 5/2, 5/3, or 5/4 or of 2.5Y 5/2 or 5/4. Moist color is 10YR 3/2, 3/3, 3/4, 4/3, or 4/4 or 2.5Y 3/2, 4/2, or 4/4. The horizon is very gravelly clay loam or very gravelly clay with 35 to 50 percent clay and 35 to 60 percent rock fragments consisting of pebbles and cobbles. Reaction is medium acid to neutral.

Skyhigh Series

The Skyhigh series consists of moderately deep, well drained soils on hills. These soils formed in material weathered from sandstone or shale. Slope is 8 to 50 percent.

Soils of the Skyhigh series are fine, montmorillonitic, thermic Mollic Haploxeralfs.

Typical pedon of a Skyhigh loam in an area of Skyhigh-Millsholm loams, 15 to 50 percent slopes, on the south side of a dirt road 0.4 mile from its intersection with Rivendell Road, 0.3 mile from the intersection of Rivendell Road and Morgan Valley Road; 800 feet south and 1,800 feet east of the northwest corner of sec. 8, T. 12 N., R. 6 W., Lower Lake quadrangle.

A1—0 to 2 inches; brown (10YR 4/3) loam, very dark grayish brown (10YR 3/2) moist; weak very fine and fine granular and subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; many very fine and few fine roots; many very fine and fine interstitial pores; 2 percent pebbles 2 to 25 millimeters in diameter; slightly acid; abrupt wavy boundary.

B1t—2 to 8 inches; brown (10YR 4/3) clay loam, dark brown (10YR 3/3) moist; strong fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and few fine roots; common very fine and many fine interstitial pores; common moderately thick clay films on peds; 2 percent pebbles 2 to 25 millimeters in diameter; slightly acid; gradual wavy boundary.

B21t—8 to 22 inches; brown (10YR 4/3) clay, dark yellowish brown (10YR 4/4) moist; strong medium and coarse subangular blocky structure; very hard, very firm, sticky and plastic; few very fine and fine roots; common very fine and few fine tubular pores; common moderately thick and few thick clay films on peds and in pores; 5 percent pebbles 2 to 25 millimeters in diameter; slightly acid; gradual wavy boundary.

B22t—22 to 30 inches; yellowish brown (10YR 5/4) clay, dark yellowish brown (10YR 4/4) moist; strong medium and coarse subangular blocky structure; extremely hard, very firm, sticky and plastic; few very fine, fine, and medium roots; common very fine and fine tubular pores; common moderately thick clay films on peds and in pores; 5 percent pebbles 2 to 25 millimeters in diameter; slightly acid; clear wavy boundary.

B3t—30 to 38 inches; variegated yellowish brown and strong brown (10YR 5/4, 7.5YR 4/6) clay, dark yellowish brown and dark grayish brown (10YR 4/4, 4/6, 4/2) moist; strong medium and coarse subangular blocky structure; few medium and coarse roots; common very fine and fine tubular pores; common moderately thick and thick clay films on peds and in pores; 10 percent pebbles 2 to 25 millimeters in diameter; slightly acid; abrupt wavy boundary.

R—38 inches; hard, fractured sandstone; fractures are 1 to 10 millimeters wide and 25 to 50 millimeters apart.

Thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 6 and 19 inches is dry in all parts from July 1 to October 30 and is moist in all parts from January 1 to April 30.

The A horizon has color of 10YR 4/3, 5/2, or 5/3. Moist color is 10YR 3/1, 3/2, or 3/3. The horizon is loam and has 0 to 15 percent pebbles. It is slightly acid to neutral. Some pedons have an A12 horizon.

The B2t horizon is 10YR 4/3, 5/3, or 5/4. Moist color is 10YR 4/2, 4/3, 4/4, 4/6, or 5/4. In some pedons the lower part of this horizon is not variegated. The horizon is clay loam or clay and has 35 to 50 percent clay. It has 0 to 15 percent pebbles. It is medium acid to neutral.

Sleeper Series

The Sleeper series consists of deep, well drained soils on hills. These soils formed in material weathered from sandstone, shale, or siltstone. Slope is 5 to 50 percent.

Soils of the Sleeper series are fine, montmorillonitic, thermic Mollic Haploxeralfs.

Typical pedon of a Sleeper loam in an area of Sleeper Variant-Sleeper loams, 30 to 50 percent slopes, on Middle Mountain, about 4,400 feet south of Hunter Point; 2,500 feet south and 2,100 feet west of the northeast corner of sec. 34, T. 16 N., R. 10 W., Upper Lake quadrangle.

O1—1 inch to 0; oak leaf litter.

A1—0 to 4 inches; brown (7.5YR 5/2) loam, dark brown (7.5YR 3/2) moist; moderate fine and medium subangular blocky structure parting to moderate fine and medium granular; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and few fine and medium roots; common very fine and fine tubular pores and many very fine, fine, and medium interstitial pores; neutral; abrupt wavy boundary.

B1t—4 to 12 inches; pinkish gray (7.5YR 6/2) loam, brown (7.5YR 4/2) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, firm, sticky and slightly plastic; many very fine roots, common fine and medium roots, and few coarse roots; many very fine, common fine, and few medium tubular pores and common very fine and fine interstitial pores; few thin clay films on peds, in pores, and bridging mineral grains; neutral; clear wavy boundary.

B21t—12 to 20 inches; pinkish gray (7.5YR 6/2) clay loam, brown (7.5YR 4/2) moist; weak fine and medium prismatic structure parting to fine and medium angular blocky; hard, firm, sticky and plastic; common very fine, fine, medium, and coarse roots; few very fine tubular pores and common very fine and fine interstitial pores; few thin clay films on peds, in pores, and bridging mineral grains; medium acid; abrupt wavy boundary.

B22t—20 to 45 inches; pale brown (10YR 6/3) clay, dark brown (10YR 3/4) moist; moderate medium and coarse prismatic structure parting to medium coarse and very coarse angular blocky; hard, firm, sticky and plastic; few very fine, fine, and coarse roots; few very fine tubular pores and common very fine and fine and few medium interstitial pores; many moderately thick and thick clay films on peds, in pores, and bridging mineral grains; common slickensides; medium acid; abrupt irregular boundary.

R—45 inches; hard, fractured sandstone; fractures are 1 to 10 millimeters wide and 25 to 250 millimeters apart and are filled with soil material; rock can be cut with a spade but will not slake in water.

Thickness of the solum and depth to a lithic contact are 40 to 60 inches. Mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 18 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. Base saturation (sum of cations) is 75 to 95 percent throughout the profile. Slickensides are not present in all pedons.

The A horizon has color of 7.5YR 4/2 or 5/2 or of 10YR 5/2, 5/3, 6/2, or 6/3. Moist color is 7.5YR 3/2, 3/3, or 3/4. The horizon is 4 to 7 inches thick. It is slightly acid or neutral.

The B2t horizon has color of 7.5YR 5/2 or 6/2 or of 10YR 4/2, 4/3, 5/2, 5/3, 5/4, 6/3, or 6/4. Moist color is 7.5YR 4/2 or 10YR 3/4, 4/3, 4/4, or 5/3. The horizon is clay loam or clay. The particle-size control section averages 35 to 50 percent clay. It is medium acid or slightly acid.

Sleeper Variant

The Sleeper Variant consists of very deep, well drained soils on hills. These soils formed in material weathered from sandstone, shale, or siltstone commonly associated with fault material. Slope is 5 to 50 percent.

Soils of the Sleeper Variant are fine, montmorillonitic, thermic Mollic Haploxeralfs.

Typical pedon of a Sleeper Variant loam in an area of Sleeper Variant-Sleeper loams, 15 to 30 percent slopes, about 3,250 feet northwest of the Sewage Treatment Plant gate; 2,125 feet north and 1,812 feet west of the southeast corner of sec. 25, T. 15 N., R. 10 W., Lakeport quadrangle.

A11—0 to 5 inches; light brownish gray (10YR 6/2) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots; few very fine tubular pores and many very fine interstitial pores; slightly acid; abrupt wavy boundary.

A12—5 to 12 inches; grayish brown (10YR 5/2) loam, very dark grayish brown (10YR 3/2) moist; weak coarse and very coarse prismatic structure; hard, friable, slightly sticky and slightly plastic; many very fine roots; common very fine and few fine and medium tubular pores; neutral; clear wavy boundary.

B1t—12 to 20 inches; dark grayish brown (2.5Y 4/2) clay loam, dark brown (10YR 3/3) moist; weak coarse and very coarse prismatic structure; hard, firm, sticky and plastic; few very fine roots; many very fine and few fine and medium tubular pores; few thin clay films in pores and bridging mineral grains; 3 percent pebbles 2 to 25 millimeters in diameter; neutral; abrupt wavy boundary.

B21t—20 to 37 inches; variegated olive (5Y 5/3) and light olive brown (2.5Y 5/6) clay loam, dark grayish

brown (2.5Y 4/2) and light olive brown (2.5Y 5/4) moist; weak coarse prismatic structure; hard, firm, sticky and plastic; few very fine tubular pores; many moderately thick clay films in pores; 30 percent irregularly shaped light olive brown soft saprolite masses 2 to 5 millimeters in diameter; 7 percent soft pebbles 2 to 75 millimeters in diameter; mildly alkaline; clear wavy boundary.

B22t—37 to 56 inches; olive gray (5Y 5/2) clay, olive gray (5Y 4/2) moist; weak coarse and very coarse subangular blocky structure; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; common moderately thick clay films in pores; many pressure faces and few slickensides; 25 percent soft saprolite fragments 2 to 75 millimeters in diameter; slightly effervescent; disseminated lime; moderately alkaline; clear wavy boundary.

B3t—56 to 75 inches; olive gray (5Y 5/2) clay loam, gray (5Y 5/1) moist; weak coarse and very coarse subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine roots; few very fine tubular pores; few moderately thick clay films in pores; common pressure faces; 70 percent soft saprolite fragments 2 to 75 millimeters in diameter; strongly effervescent; disseminated lime; moderately alkaline.

Thickness of the solum and depth of the profile are 60 inches or more. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 8 and 24 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 30. Slickensides are not present in all pedons. Base saturation (sum of cations) is 75 to 95 percent throughout the profile.

The A horizon has color of 10YR 5/2, 5/3, 5/4, 6/2, 6/3, or 6/4. Moist color is 10YR 3/2, 3/3, or 3/4. Organic matter content is 0.25 to 1.0 percent below a depth of 10 inches. Reaction is slightly acid or neutral.

The B2t horizon has color of 10YR or 5Y 4/2, 4/3, 5/2, or 5/3 or of 2.5Y 4/2, 5/2, or 5/6. Moist color is 10YR or 5Y 3/1, 3/2, 4/1, 4/2, 4/3, 4/4, 5/1, or 5/2 or 2.5Y 3/2, 4/2, 5/2, or 5/4. The horizon is clay loam or clay and has 35 to 45 percent clay. Reaction is neutral to moderately alkaline. Disseminated lime is not present in all pedons.

Snook Series

The Snook series consists of shallow, somewhat excessively drained soils on hills and mountains. These soils formed in material weathered from sandstone or shale. Slope is 15 to 80 percent.

Soils of the Snook series are loamy, mixed, nonacid, thermic Lithic Xerorthents.

Typical pedon of a Snook loam in an area of Maymen-Etsel-Snook complex, 30 to 75 percent slopes, 100 feet east of a dirt road, about 1,250 feet north of its intersection with Morgan Valley Road, at a point about 6.6 miles east of the intersection of Morgan Valley Road and State Highway 29; 2,550 feet north and 525 feet east of the southwest corner of sec. 15, T. 12 N., R. 6 W., Lower Lake quadrangle.

A1—0 to 5 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 4/4) moist; moderate fine subangular blocky structure; slightly hard, friable, nonsticky and nonplastic; few fine, medium, and coarse roots; few fine, medium, and coarse tubular pores and common very fine and fine interstitial pores; 5 percent pebbles 2 to 50 millimeters in diameter; slightly acid; abrupt wavy boundary.

R—5 inches; fractured sandstone.

Thickness of the solum and depth to a lithic contact are 4 to 10 inches. The mean annual soil temperature is 59 to 62 degrees F. The soil usually is dry in all parts from June 1 to October 15 and is moist in all parts from December 1 to April 15. From 5 to 50 percent of the surface is covered with rock fragments. Clay content is 10 to 25 percent. Content of rock fragments in the profile ranges from 5 to 35 percent; fragments are pebbles and cobbles.

The A horizon has color of 7.5YR 4/4, 5/4, or 6/2 or of 10YR 5/4, 6/2, 6/3, or 6/4. Moist color is 7.5YR 3/4 or 4/2 or 10YR 3/4, 4/3, or 4/4.

Sobrante Series

The Sobrante series consists of moderately deep, well drained soils on hills. These soils formed in material derived from basalt. Slope is 2 to 75 percent.

Soils of the Sobrante series are fine-loamy, mixed, thermic Mollic Haploxeralfs.

Typical pedon of a Sobrante loam in an area of Sobrante-Guenoc-Hambright complex, 2 to 15 percent slopes, 0.7 mile southeast on Butts Canyon Road from its intersection with State Highway 29, 200 feet north and 100 feet east into field; Lat. 38°45'8' N., Long. 122°35'41' W. (in an unsectionalized area), Middletown quadrangle.

A11—0 to 4 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; moderate fine and coarse granular structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots; few very fine and fine and common medium and coarse tubular pores and common very fine, fine, and medium interstitial pores; 4 percent pebbles 2 to 50 millimeters in diameter; medium acid; abrupt smooth boundary.

A12—4 to 10 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; massive; hard,

friable, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine, fine, medium, and coarse tubular pores and few very fine and fine interstitial pores; 8 percent pebbles 2 to 40 millimeters in diameter; slightly acid; gradual wavy boundary.

B1t—10 to 21 inches; reddish brown (5YR 4/4) loam, dark reddish brown (5YR 3/3) moist; massive; slightly hard, friable, sticky and slightly plastic; common very fine, fine, medium, and coarse roots; common very fine, fine, and medium tubular pores and few coarse interstitial pores; few thin clay films bridging mineral grains and in pores; 10 percent pebbles; slightly acid; gradual wavy boundary.

B2t—21 to 38 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/4) moist; massive; slightly hard, very friable, sticky and plastic; common very fine, fine, medium, and coarse roots; many very fine, fine, medium, and coarse tubular pores and common very fine, fine, and medium interstitial pores; common thin and few moderately thick clay films bridging mineral grains and in pores; 8 percent pebbles; slightly acid; abrupt smooth boundary.

R—38 to 44 inches; hard, fractured basalt.

Thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 7 and 20 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 30. Rock fragments consist of pebbles and range from 0 to 20 percent throughout; the largest amount is at the surface or in the uppermost horizons. Reaction is slightly acid or medium acid throughout.

The A horizon has color of 5YR 5/4 or 4/4. Moist color is 5YR 3/2, 3/3, or 3/4. The horizon is massive and hard below a depth of 4 to 6 inches.

The B2t horizon is 5YR 4/4, 5/3, or 5/4. Moist color is 5YR 3/3, 3/4, or 4/4. The horizon is loam or clay loam with 25 to 35 percent clay. Base saturation (sum of cations) is 75 to 95 percent.

Sodabay Series

The Sodabay series consists of deep and very deep, well drained soils on hills and mountains. These soils formed in material weathered from dacite, tuff, breccia, or volcanic ash. Slope is 5 to 30 percent.

Soils of the Sodabay series are fine-loamy, mixed, thermic Mollic Haploxeralfs.

Typical pedon of Sodabay loam, 15 to 30 percent slopes, on Soda Bay Road, 100 feet east of telephone pole number 87; 2,900 feet south and 2,000 feet west from the projected northwest corner of sec. 6, T. 13 N., R. 8 W., Lucerne quadrangle.

A1—0 to 6 inches; light reddish brown (5YR 6/3) loam, dark reddish brown (5YR 3/3) moist; strong fine and medium granular structure; soft, very friable, nonsticky and nonplastic; common very fine roots; common very fine and fine interstitial pores; 5 percent pebbles 2 to 50 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

B21t—6 to 16 inches; light reddish brown (5YR 6/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; many very fine roots, common fine roots, and few medium roots; many very fine and common fine and medium interstitial and tubular pores; few thin clay films on peds and in pores; 7 percent pebbles 2 to 50 millimeters in diameter; mildly alkaline; clear wavy boundary.

B22t—16 to 26 inches; light reddish brown (5YR 6/3) clay loam, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; weakly smeary; common very fine, fine, medium, and coarse roots; common very fine and fine and few medium tubular and interstitial pores; common thin clay films on peds and in pores; 10 percent pebbles 2 to 50 millimeters in diameter; mildly alkaline; clear wavy boundary.

B23t—26 to 41 inches; light reddish brown (5YR 6/4) clay loam, dark reddish brown (5YR 3/4) moist; weak medium prismatic structure parting to moderate medium subangular blocky; hard, friable, sticky and slightly plastic; weakly smeary; common very fine roots and few fine and medium roots; common fine and medium interstitial and tubular pores; common moderately thick clay films in pores and on peds; 5 percent pebbles 2 to 50 millimeters in diameter and 2 percent cobbles 75 to 170 millimeters in diameter; mildly alkaline; gradual smooth boundary.

B24t—41 to 52 inches; light reddish brown (5YR 6/4) clay loam, dark reddish brown (5YR 3/4) moist; moderate medium and coarse subangular blocky structure; hard, friable, sticky and plastic; weakly smeary; common very fine, fine, and medium roots; common very fine and fine interstitial and tubular pores; many moderately thick clay films on peds and in pores; 5 percent pebbles 2 to 15 millimeters in diameter; mildly alkaline; clear smooth boundary.

B3t—52 to 63 inches; light reddish brown (5YR 6/4) gravelly clay loam, dark reddish brown (5YR 3/4) moist; weak coarse subangular blocky structure; hard, friable, sticky and slightly plastic; weakly smeary; common very fine, fine, and medium roots; common very fine interstitial pores and many very fine and common fine tubular pores; common moderately thick clay films on peds and in pores; 20

percent pebbles 2 to 15 millimeters in diameter; mildly alkaline; clear wavy boundary.
Cr—63 inches; weathered pyroclastic tuff.

Depth to a paralithic contact is 40 to 80 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 16 inches is moist in all parts from December 1 to March 30 and is dry in all parts from July 1 to October 15. Reaction is neutral or mildly alkaline. Content of coarse and very coarse sand is 5 to 15 percent throughout the profile. Content of rock fragments consisting of pebbles and some cobbles ranges from 5 to 20 percent throughout the profile. The clay content decreases at a depth of 50 to 60 inches. The particle-size control section averages 25 to 35 percent clay.

The A horizon has color of 5YR 6/3 or 6/4 or 7.5YR 6/4. Moist color is 5YR 3/3 or 3/4 or 7.5YR 3/4. Organic matter content is 1 to 2 percent.

The B2t horizon has color of 5YR 6/3, 6/4, 6/6, or 6/8. Moist color is 5YR 3/3 or 3/4 or 7.5YR 3/4. The upper part of the B2t horizon is loam or clay loam and is 25 to 30 percent clay. The lower part is clay loam and is 30 to 40 percent clay.

Speaker Series

The Speaker series consist of moderately deep, well drained soils on mountains. These soils formed in material weathered from sandstone or shale. Slope is 15 to 75 percent.

Soils of the Speaker series are fine-loamy, mixed, mesic Ultic Haploxeralfs.

Typical pedon of a Speaker gravelly loam in an area of Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes, on Prather Mill Grade Road, 0.47 mile south of intersection with Forest Road 1N02, about 5 feet south of road, Mendocino National Forest; 500 feet south and 1,150 feet east of the northwest corner of sec. 24, T. 17 N., R. 10 W., Elk Mountain quadrangle.

O1—1 inch to 0; layer of needles, leaves, and stems in various states of decomposition.
A11—0 to 2 inches; brown (10YR 5/3) gravelly loam, dark brown (10YR 3/3) moist; moderate very fine, fine, medium, and coarse subangular blocky structure parting to weak very fine and fine granular; slightly hard, friable, nonsticky and nonplastic; many very fine and common fine roots; common very fine and fine tubular and interstitial pores; 16 percent pebbles 2 to 25 millimeters in diameter; slightly acid; abrupt smooth boundary.
B1—2 to 8 inches; reddish yellow (7.5YR 6/6) gravelly loam, strong brown (7.5YR 4/6) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine roots and common fine, medium, and coarse roots; common very fine, fine, and medium tubular pores and few very fine and fine interstitial pores; 16 percent pebbles 2 to 25 millimeters in diameter; medium acid; clear smooth boundary.
B21t—8 to 15 inches; reddish yellow (7.5YR 6/6) clay loam, strong brown (7.5YR 5/6) moist; strong fine, medium, and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine, fine, medium, and coarse roots; common very fine, fine, and medium tubular pores and few very fine and fine interstitial pores; common moderately thick clay films on peds and in pores; 10 percent pebbles 2 to 25 millimeters in diameter; medium acid; gradual smooth boundary.
B22t—15 to 27 inches; reddish yellow (5YR 7/6) clay loam, yellowish red (5YR 5/6) moist; strong fine, medium, and coarse subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and medium roots and many coarse roots; common very fine, fine, and medium tubular pores and few very fine and fine interstitial pores; common moderately thick clay films on peds and in pores; 10 percent pebbles 2 to 25 millimeters in diameter; medium acid; gradual wavy boundary.
Cr—27 to 30 inches; weathered sandstone with many thick clay films on rock faces; few fine roots in fractures in bedrock.

Thickness of the solum and depth to a paralithic contact are 20 to 40 inches. The mean annual soil temperature is 49 to 54 degrees F. The part of the profile between depths of 8 and 18 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to May 15. The particle-size control section averages 0 to 35 percent rock fragments consisting of pebbles and cobbles and 25 to 35 percent clay.

The A horizon has color of 7.5YR or 10YR 5/3, 5/4, 6/3, or 6/4. Moist color is 7.5YR or 10YR 3/2, 3/3, 3/4, or 4/4. The horizon is loam or gravelly loam. Reaction is slightly acid or medium acid.

The B2t horizon is 5YR or 7.5YR 7/6, 6/6, 6/4, 5/6, or 5/4. Moist color is 7.5YR or 5YR 5/6, 5/4, 4/6, or 4/4. The horizon is clay loam, gravelly clay loam, or cobbly clay loam. Base saturation (sum of cations) is 40 to 70 percent. Reaction is medium acid or strongly acid.

Some, but not all, areas of Speaker soils in this survey area have a warmer mean annual soil temperature than is defined in the range for the series. This difference, however, does not significantly affect their use and management.

Speaker Variant

The Speaker Variant consists of shallow, well drained soils on mountains. These soils formed in material

weathered from sandstone or shale. Slope is 5 to 30 percent.

Soils of the Speaker Variant are loamy, mixed, mesic, shallow Ultic Haploxeralfs.

Typical pedon of a Speaker Variant loam in an area of Speaker-Speaker Variant-Sanhedrin association, 5 to 30 percent slopes, 315 feet west and 100 feet south of the intersection of Forest Road 1N02 and the Benmore Creek off-road vehicle trail, Mendocino National Forest; 1,300 feet east and 250 feet south of the northwest corner of sec. 10, T. 17 N., R. 10 W., Elk Mountain quadrangle.

A11—0 to 4 inches; light yellowish brown (10YR 6/4) loam, dark yellowish brown (10YR 3/4) moist; moderate fine and medium subangular blocky structure parting to moderate very fine, fine, and medium granular; soft, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine, fine, and medium interstitial pores and few very fine and fine tubular pores; 10 percent pebbles 2 to 12 millimeters in diameter; slightly acid; clear smooth boundary.

B1—4 to 10 inches; light yellowish brown (10YR 6/4) clay loam, brown (7.5YR 4/4) moist; moderate fine and medium subangular blocky structure parting to moderate very fine and fine granular; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium interstitial pores and common very fine and fine tubular pores; 10 percent pebbles 2 to 12 millimeters in diameter; slightly acid; clear smooth boundary.

B2t—10 to 17 inches; reddish yellow (7.5YR 7/6) gravelly clay loam, strong brown (7.5YR 5/6) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, slightly sticky and plastic; common very fine, fine, and medium roots; common very fine, fine, and medium interstitial and tubular pores; common moderately thick clay films on peds and in pores; 16 percent pebbles 2 to 12 millimeters in diameter; medium acid; clear wavy boundary.

Cr—17 to 26 inches; highly weathered, soft sandstone with fractures 6 to 12 millimeters wide and 24 to 48 millimeters apart; common fine roots extend down into fractures.

Depth to a paralithic contact is 10 to 20 inches. The mean annual soil temperature is 53 to 59 degrees F. The part of the profile between depths of 7 and 19 inches is dry in all parts from June 15 to October 1 and is moist in all parts from December 1 to April 30.

The A horizon has color of 10YR 5/3, 6/3, or 6/4 or of 7.5YR 5/4. Moist color is 10YR 3/3 or 3/4 or 7.5YR 4/4. Pebble content is 0 to 15 percent. The horizon is neutral to medium acid.

The B2t horizon has color of 10YR 6/4 or 7.5YR 7/6. Moist color is 10YR 4/4 or 7.5YR 4/4, 4/6, or 5/6. The horizon is gravelly clay loam or clay loam and has 27 to 35 percent clay. Pebble content is 10 to 20 percent. Reaction is slightly acid or medium acid.

Squawrock Series

The Squawrock series consists of moderately deep, well drained soils on hills and mountains. These soils formed in material weathered from sandstone. Slope is 15 to 50 percent.

Soils of the Squawrock series are loamy-skeletal, mixed, thermic Mollic Haploxeralfs.

Typical pedon of a Squawrock gravelly loam in an area of Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes, 350 feet north of the intersection of Road 23N56 and Road 9W28, on Road 23N56, in Mendocino National Forest; 1,750 feet south and 560 feet east of the northwest corner of sec. 27, T. 20 N., R. 9 W.; Kneecap Ridge quadrangle.

A1—0 to 8 inches; grayish brown (10YR 5/2) gravelly loam, very dark grayish brown (10YR 3/2) moist; strong medium granular structure; soft, friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots; many very fine, fine, and medium interstitial pores and common very fine, fine, and medium tubular pores; 15 percent pebbles 2 to 75 millimeters in diameter; neutral; gradual wavy boundary.

B1t—8 to 19 inches; light brownish gray (10YR 6/2) very gravelly clay loam, dark grayish brown (10YR 4/2) moist; strong fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and medium roots; many very fine, fine, and medium tubular and interstitial pores; common moderately thick clay films on peds and in pores; 25 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 127 millimeters in diameter; slightly acid; gradual wavy boundary.

B2t—19 to 37 inches; light brownish gray (10YR 6/2) very gravelly clay loam, dark brown (10YR 4/3) moist; strong fine and medium angular blocky structure; slightly hard, friable, sticky and plastic; common fine, medium, and coarse roots; many very fine, fine, and medium tubular and interstitial pores; common moderately thick clay films on peds and in pores; 20 percent pebbles 2 to 75 millimeters in diameter and 20 percent cobbles 75 to 127 millimeters in diameter; medium acid; gradual wavy boundary.

R—37 inches; hard, fractured sandstone; fractures 75 millimeters apart and 6 millimeters wide.

Thickness of the solum and depth to a lithic contact are 20 to 40 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 7 and 16 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 15.

The A horizon has color of 10YR 6/4, 6/3, 6/2, 5/4, or 5/2. Moist color is 10YR 3/3 or 3/2 or 7.5YR 3/4. The horizon is medium acid to neutral. It is 10 to 35 percent rock fragments consisting of pebbles and cobbles. Organic matter content is 1 to 2 percent.

The B2t horizon has color of 10YR 7/4, 7/2, 6/2, or 5/4. Moist color is 10YR 5/4, 4/3, 4/2, 3/4, or 3/3 or 7.5YR 4/4. The horizon is very gravelly or very cobbly loam, very gravelly or very cobbly clay loam, or very gravelly sandy clay loam and has 20 to 32 percent clay. It is strongly acid to slightly acid. It is 35 to 60 percent rock fragments consisting of pebbles and cobbles. Base saturation (sum of cations) is 75 to 90 percent.

Still Series

The Still series consists of very deep, well drained soils on alluvial plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 8 percent.

Soils of the Still series are fine-loamy, mixed, thermic Cumulic Haploxerolls.

Typical pedon of a Still loam in an area of Still loam, stratified substratum, about 690 feet south on Highland Springs Road from its intersection with Fritch Road, then about 1,100 feet east of the road; 688 feet south and 1,125 feet east of the northwest corner of sec. 20, T. 13 N., R. 9 W., Highland Springs quadrangle.

Ap—0 to 6 inches; brown (10YR 5/3) loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; hard, friable, sticky and slightly plastic; common very fine and fine roots and few medium roots; common very fine and fine tubular and interstitial pores; 5 percent pebbles 2 to 40 millimeters in diameter; neutral; clear wavy boundary.

IIA12—6 to 36 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; weak medium and coarse subangular blocky structure; hard, friable, slightly sticky and plastic; common very fine, fine, and medium roots; common very fine and fine tubular pores; 5 percent pebbles 2 to 40 millimeters in diameter; neutral; diffuse wavy boundary.

C1—36 to 41 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; many fine and medium prominent yellowish brown (10YR 5/6) mottles; massive; hard, friable, slightly sticky and plastic; few very fine and fine roots; common very fine and fine tubular pores; 5 percent pebbles 2 to 40 millimeters in diameter; mildly alkaline; clear wavy boundary.

IIIC2—41 to 52 inches; brown (10YR 5/3) loam, dark grayish brown (10YR 4/2) moist; common medium and large prominent yellowish brown (10YR 5/8) mottles; massive; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; common very fine and fine tubular pores and common fine interstitial pores; 10 percent pebbles 2 to 40 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

IVC3—52 to 70 inches; brown (10YR 5/3) extremely gravelly loamy coarse sand, dark grayish brown (10YR 4/2) moist; massive; soft, loose, nonsticky and nonplastic; few very fine and fine roots; common very fine and fine tubular pores and many very fine interstitial pores; 65 percent pebbles 2 to 75 millimeters in diameter; moderately alkaline.

Thickness of the solum is 20 to 40 inches, and the profile is more than 60 inches deep. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 6 and 18 inches is dry in all parts from July 15 to October 15 and is moist in all parts from December 1 to April 15. Organic matter content is 1 to 3 percent to a depth of 25 inches and decreases irregularly with increasing depth. Rock fragments, mostly pebbles, make up 0 to 35 percent of the profile. The particle-size control section averages 20 to 35 percent clay. Pedons adjacent to stream channels are subject to rare periods of flooding.

The A horizon has color of 10YR 4/1, 4/2, 5/1, 5/3, or 5/4. Moist color is 10YR 2/1, 2/2, 3/1, 3/2, or 3/3. The horizon is loam or gravelly loam in the upper part and clay loam or gravelly clay loam in the lower part. Base saturation is 75 to 95 percent. Reaction is slightly acid to neutral.

The C horizon has color of 10YR 4/3, 5/2, 5/3, 5/4, 6/2, or 6/3 or of 2.5Y 6/2. Moist color is 10YR 3/2, 3/3, or 4/2 or 2.5Y 4/2. In some pedons mottles are not present. The horizon is stratified clay loam, sandy clay loam, loam, and sandy loam. Some pedons have a layer of very gravelly or extremely gravelly coarse sandy loam, loamy sand, or sand below a depth of 40 to 50 inches. Reaction is slightly acid to moderately alkaline.

The Still soil in map unit 235 is a taxadjunct to the Still series because it has a mean annual precipitation of as much as 40 inches, which is outside the range defined for the series. This difference, however, does not significantly affect its use and management.

Stonyford Series

The Stonyford series consists of shallow, somewhat excessively drained soils on hills. These soils formed in material weathered from basalt. Slope is 30 to 50 percent.

Soils of the Stonyford series are loamy, mixed, thermic Lithic Mollic Haploxeralfs.

Typical pedon of a Stonyford gravelly loam in an area of Stonyford-Guenoc complex, 30 to 50 percent slopes, about 1,100 feet up powerline access road from its intersection with State Highway 20, then 60 feet upslope; 1,250 feet east and 750 feet south of the northwest corner of sec. 2, T. 13 N., R. 7 W., Clearlake Oaks Southwest quadrangle.

A1—0 to 2 inches; dark reddish brown (5YR 3/4) gravelly loam, dark reddish brown (5YR 3/3) moist; moderate fine subangular blocky structure parting to weak fine granular; soft, very friable, nonsticky and nonplastic; few very fine roots; many very fine and fine interstitial pores; 15 percent pebbles 2 to 12 millimeters in diameter; slightly acid; abrupt wavy boundary.

B1t—2 to 5 inches; yellowish red (5YR 4/6) gravelly loam, dark reddish brown (5YR 3/4) moist; moderate fine subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and very fine roots and few coarse roots; many very fine and common fine interstitial pores; few thin clay films on peds; 15 percent pebbles 2 to 12 millimeters in diameter; neutral; abrupt wavy boundary.

B21t—5 to 10 inches; yellowish red (5YR 4/6) gravelly clay loam, dark reddish brown (5YR 3/4) moist; weak fine subangular blocky structure; slightly hard, friable, sticky and plastic; common fine and medium roots and few coarse roots; many very fine and common fine interstitial pores; few thin clay films on peds; 20 percent pebbles 2 to 12 millimeters in diameter; neutral; abrupt wavy boundary.

R—10 inches; highly fractured metamorphosed basalt; fractures are 6 to 12 millimeters apart and less than 2 millimeters wide.

Thickness of the solum and depth to a lithic contact are 10 to 20 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between a depth of 8 inches and the lithic contact is dry in all parts from July 15 to October 15 and is moist in all parts from December 1 to April 15. Reaction is slightly acid or neutral throughout.

The A horizon has color of 5YR 3/4 or 4/4 or of 7.5YR 4/4. Moist color is 5YR 3/3.

The B2t horizon has color of 2.5YR or 5YR 4/6. Moist color is 2.5YR or 5YR 3/4. The horizon is gravelly clay loam and has 27 to 35 percent clay and 15 to 35 percent pebbles. Some pedons have a discontinuous B3t horizon that is 30 to 45 percent rock fragments.

Talmage Series

The Talmage series consists of very deep, somewhat excessively drained soils on alluvial fans and flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 8 percent.

Soils of the Talmage series are loamy-skeletal, mixed, thermic Fluventic Haploxerolls.

Typical pedon of a Talmage very gravelly sandy loam in an area of Still-Talmage complex, 2 to 8 percent slopes, on Scotts Valley Road, 0.4 mile south of the bridge over Blue Lakes outlet and 50 feet east of the road; 1,150 feet south and 3,300 feet west of the northeast corner of sec. 17, T. 15 N., R. 10 W., Upper Lake quadrangle.

A11—0 to 7 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; moderate and strong fine and medium subangular blocky structure parting to medium granular; slightly hard, very friable, nonsticky and nonplastic; many very fine and fine roots and few medium roots; many very fine, fine, and medium interstitial pores; 50 percent subangular pebbles; neutral; clear wavy boundary.

A12—7 to 33 inches; grayish brown (10YR 5/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; massive; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots and few medium roots; common fine and medium and few coarse interstitial and tubular pores; few pressure faces and disoriented clay coatings; 50 percent pebbles; mildly alkaline; abrupt wavy boundary.

C1—33 to 42 inches; light yellowish brown (10YR 6/4) gravelly sandy loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, very friable, slightly sticky and nonplastic; common very fine roots and few fine, medium, and coarse roots; common very fine, fine, and medium tubular and interstitial pores; few pressure faces and disoriented clay coatings; 15 percent pebbles; mildly alkaline; abrupt wavy boundary.

IIA1b—42 to 52 inches; grayish brown (10YR 5/2) very gravelly loam, very dark grayish brown (10YR 3/2) moist; massive; hard, very friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; common fine, medium, and coarse interstitial pores and few very fine and fine tubular pores; 50 percent pebbles; mildly alkaline; abrupt wavy boundary.

IIIC2—52 to 70 inches; light yellowish brown (10YR 6/4) gravelly loam, dark yellowish brown (10YR 4/4) moist; massive; slightly hard, friable, slightly sticky and slightly plastic; common very fine roots and few fine, medium, and coarse roots; common very fine and fine interstitial and tubular pores; 25 percent pebbles; mildly alkaline.

Thickness of the solum is 22 to 42 inches, and the profile is more than 60 inches deep. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 25 and 38 inches is dry in all

parts from July 1 to September 30 and is moist in all parts from January 1 to April 15. Organic matter content is 1 to 2 percent in the upper 20 inches and less than 1 percent below that depth, and it decreases irregularly with increasing depth. Reaction is slightly acid to mildly alkaline throughout the profile.

The A horizon has color of 10YR 4/2, 5/2, or 5/3. Moist color is 10YR 3/2 or 3/3 or 7.5YR 3/2. The horizon is very gravelly sandy loam and has 35 to 55 percent rock fragments consisting mostly of pebbles and some cobbles.

The C horizon has color 10YR 5/3, 5/4, 6/3, or 6/4. Moist color is 10YR 3/3, 3/4, or 4/4. The horizon is stratified gravelly sandy loam, gravelly loam, very gravelly loamy coarse sand, and very gravelly loam. The particle-size control section averages 35 to 60 percent rock fragments, mostly pebbles and some cobbles, and 5 to 15 percent clay.

Tulelake Series

The Tulelake series consists of very deep, poorly drained soil in lake basins. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Tulelake series are fine, montmorillonitic, nonacid, thermic Aeric Fluvaquents.

Typical pedon of Tulelake silty clay loam, protected, about 1,400 feet south on Reclamation Road from its intersection with Reclamation Cutoff Road, then 50 feet west from the road; 2,800 feet south and 1,200 feet east of the northwest corner of sec. 20, T. 15 N., R. 9 W., Upper Lake quadrangle.

Ap—0 to 10 inches; grayish brown (10YR 5/2) silty clay loam, dark gray (10YR 4/1) moist; few fine distinct strong brown (7.5YR 5/8) mottles, brown (7.5YR 4/4) moist; moderate fine, medium, and coarse subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; common very fine, fine, and medium tubular pores; slightly acid; clear smooth boundary.

C1—10 to 26 inches; light brownish gray (10YR 6/2) silty clay loam, dark gray (10YR 4/1) moist; few fine distinct and prominent yellowish brown (10YR 5/4) and strong brown (7.5YR 5/8) mottles, brown (10YR 4/3) and dark reddish brown (5YR 3/4) moist; moderate coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores; neutral; abrupt wavy boundary.

C2—26 to 30 inches; light brownish gray (10YR 6/2) silty clay loam, dark grayish brown (10YR 4/2) moist; common fine distinct and prominent gray (10YR 6/1) and yellowish red (5YR 5/8) mottles, dark gray (N 4/0) and dark reddish brown (2.5YR 3/4) moist; weak fine and medium subangular blocky structure; hard, firm, sticky and plastic; common very fine roots; common very fine, fine, and medium tubular pores; few pressure faces on peds; mildly alkaline; abrupt wavy boundary.

IIC3—30 to 39 inches; gray (10YR 5/1) silty clay, very dark gray (10YR 3/1) moist; few fine distinct brown (7.5YR 4/4) mottles, strong brown (7.5YR 5/6) moist, and common medium distinct pale brown (10YR 6/3) mottles, dark grayish brown (10YR 4/2) moist; moderate fine, medium, and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores; common pressure faces on peds; mildly alkaline; clear wavy boundary.

IIC4ca—39 to 43 inches; gray (10YR 6/1) silty clay, dark gray (10YR 4/1) moist; few fine prominent strong brown (7.5YR 5/8) mottles, yellowish red (5YR 4/6) moist; moderate fine, medium, and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and few fine roots; common very fine and fine tubular pores; common pressure faces on peds; many slightly effervescent areas of disseminated lime and common strongly effervescent filaments and threads of lime; moderately alkaline; abrupt wavy boundary.

IIIC5ca—43 to 47 inches; gray (10YR 6/1) silty clay loam, dark gray (10YR 4/1) moist; few fine prominent strong brown (7.5YR 5/8) mottles, yellowish red (5YR 4/6) moist; moderate fine, medium, and coarse subangular blocky structure; hard, firm, sticky and plastic; common very fine and few fine roots; common very fine and fine tubular pores; few pressure faces on peds; many slightly effervescent areas of disseminated lime and common strongly effervescent filaments and threads of lime; moderately alkaline; clear wavy boundary.

IVC6ca—47 to 77 inches; dark gray (10YR 4/1) silty clay, very dark gray (N 3/0) moist; few fine prominent light yellowish brown (10YR 6/4) mottles, yellowish brown (10YR 5/4) moist; moderate medium and coarse prismatic structure parting to moderate medium and coarse subangular blocky; hard, firm, sticky and plastic; few very fine and fine roots; common very fine and fine tubular pores; few pressure faces on peds; many slightly effervescent filaments and threads of lime; moderately alkaline.

Thickness of the solum is 6 to 10 inches, and the depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. A seasonal high water table is 3 feet above the surface to 3 feet below the surface from December to April. In summer and early in fall the water table drops to a depth of 3 feet to more than 6 feet. Distinct to prominent mottles occur throughout the profile. Organic matter content is 1 to 3 percent in the upper 8 inches of the profile and is 0.25 to 1.0 percent below a depth of 8 inches. Organic matter content decreases irregularly with

increasing depth. The particle-size control section averages 35 to 50 percent clay.

The A horizon has color of 10YR 4/2, 5/2, or 6/2 or of 2.5Y 4/2. Moist color is 10YR 3/2, 4/1, or 5/1 or 2.5Y 4/2. Reaction is medium acid or slightly acid.

The C horizon has color of 10YR 4/1, 5/1, 5/2, 6/1, or 6/2 or of 2.5Y 4/2. Moist color is N 3/0; 10YR 2/1, 3/1, 4/1, 4/2, 4/3, or 4/4; or 2.5Y 4/4. The part of the C horizon to a depth of 20 inches has moist chroma of 0, 1, or 2. Moist chroma of 2, 3, or 4 are present in some layers between depths of 20 and 30 inches. The horizon is stratified silty clay loam, clay loam, silty clay, or clay. Reaction is slightly acid to moderately alkaline. The lower part of the C horizon is calcareous in most pedons.

Tyson Series

The Tyson series consists of moderately deep, well drained soils on mountains. These soils formed in material weathered from metamorphosed sandstone. Slope is 30 to 75 percent.

Soils of the Tyson series are loamy-skeletal, mixed, mesic Typic Xerumbrepts.

Typical pedon of a Tyson gravelly loam in an area of Tyson-Neuns gravelly loams, 30 to 75 percent slopes, about 1.3 miles northwest of the intersection of Roads 20N04 and 19N16 and 30 feet north and downslope from Road 20N04; 600 feet south and 4,075 feet east of the northwest corner of sec. 27, T. 19 N., R. 11 W., Pomo Northeast quadrangle.

O1—1.5 inches to 0; decomposed but recognizable oak leaves, twigs, and acorns.

A11—0 to 9 inches; dark grayish brown (10YR 4/2) gravelly loam, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure parting to moderate very fine, fine, and medium granular; soft, friable, nonsticky and nonplastic; common very fine roots and many fine and medium roots; many very fine and medium interstitial pores and common very fine and fine tubular pores; 20 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 200 millimeters in diameter; slightly acid; gradual smooth boundary.

A12—9 to 15 inches; brown (10YR 4/3) very gravelly loam, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure parting to moderate very fine, fine, and medium granular; slightly hard, friable, nonsticky and nonplastic; common very fine and coarse roots and many fine and medium roots; common very fine and fine tubular pores and many very fine, fine, and medium interstitial pores; 25 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 225 millimeters in diameter; slightly acid; clear wavy boundary.

B2—15 to 27 inches; light yellowish brown (10YR 6/4) very cobbly clay loam, yellowish brown (10YR 5/4) moist; moderate fine, medium, and coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common fine and medium roots; common very fine and fine interstitial pores and many very fine and fine tubular pores; 25 percent pebbles 2 to 75 millimeters in diameter and 30 percent cobbles 75 to 250 millimeters in diameter; slightly acid; gradual wavy boundary.

R—27 inches; hard, fractured metamorphosed sandstone; fractures are 5 to 10 millimeters wide and 25 to 125 millimeters apart.

Depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature is 49 to 55 degrees F. The part of the profile between depths of 5 and 15 inches is dry in all parts from July 1 to October 15 and is moist from December 1 to April 30.

The A horizon has color of 10YR 4/2, 4/3, or 5/2. Moist color is 10YR 3/1, 3/2, or 3/3. The profile has 2 to 10 percent organic matter. It is slightly acid or medium acid.

The B2 horizon has color of 10YR 5/3, 5/4, 6/3, or 6/4. Moist color is 10YR 3/2, 3/3, 4/3, or 5/4. The profile is very gravelly loam, very cobbly loam, very gravelly clay loam, or very cobbly clay loam and has 20 to 30 percent clay. It is slightly acid to strongly acid.

Vitrandepts

Vitrandepts are moderately deep and deep, excessively drained soils on and around volcanic cinder cones. They formed in scoriaceous magmatic ejecta. Slope is 15 to 75 percent.

Reference pedon of Vitrandepts in an area of Vitrandepts-Cinder land complex, 15 to 75 percent slopes, at the south end of the quarry south of St. Anthonys Church; 350 feet south and 2,400 feet east of the northwest corner of sec. 4, T. 13. N., R. 7 W., Clearlake Oaks Southwest quadrangle.

A11—0 to 7 inches; brown (7.5YR 4/4) gravelly sandy loam, dark reddish brown (5YR 3/3) moist; weak fine and medium subangular blocky structure parting to moderate fine granular; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium roots; common fine and medium interstitial pores; 25 percent pebble-sized cinders and 5 percent cobble-sized cinders; slightly acid; clear wavy boundary.

A12—7 to 18 inches; brown (7.5YR 5/4) very gravelly sandy loam, dark reddish brown (5YR 3/4) moist; weak fine and medium subangular blocky structure; soft, very friable, nonsticky and nonplastic; many very fine and fine roots and common medium roots; common fine and medium interstitial pores; 30

percent pebble-sized cinders and 10 percent cobble-sized cinders; slightly acid; gradual wavy boundary.
B2—18 to 37 inches; yellowish red (5YR 5/6) very gravelly sandy loam, reddish brown (5YR 4/4) moist; weak fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; many very fine, fine, and medium roots and common coarse roots; few fine and medium interstitial pores; 40 percent pebble-sized cinders and 15 percent cobble-sized cinders; slightly acid; gradual wavy boundary.
C—37 to 53 inches; yellowish red (5YR 5/6) extremely cobbly sandy loam, yellowish red (5YR 4/6) moist; single grain; loose, nonsticky and nonplastic; many very fine, fine, and medium roots and few coarse roots; 40 percent pebble-sized cinders and 30 percent cobble- and stone-sized cinders; medium acid; clear wavy boundary.
R—53 to 60 inches; scoriaceous basaltic cinders.

Depth of the profile ranges from 20 to 60 inches. Reaction is medium acid to neutral. Pebble-, cobble-, and stone-sized cinders make up 30 to 70 percent of the soil and commonly increase in content and size as depth increases.

The A, B2, and C horizons have hue of 7.5YR, 5YR, or 2.5YR. Texture is gravelly, very gravelly, very cobbly, extremely gravelly, or extremely cobbly sandy loam or sandy clay loam that has 10 to 25 percent clay.

Wappo Series

The Wappo series consists of very deep, moderately well drained soils on terraces. These soils formed in alluvium derived from mixed sources. Slope is 2 to 15 percent.

Soils of the Wappo series are fine, montmorillonitic, thermic Mollic Palexeralfs.

Typical pedon of Wappo loam, 2 to 8 percent slopes, about 1,400 feet west on Voigt Road from its intersection with Highland Springs Road, then 1,200 feet south into orchard; 1,300 feet south and 2,400 feet west of the northeast corner of sec. 18, T. 13 N., R. 9 W., Highland Springs quadrangle.

Ap—0 to 4 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure parting to moderate fine, medium, and coarse granular; hard, friable, slightly sticky and slightly plastic; many very fine roots; many very fine interstitial pores and common very fine tubular pores; 2 percent pebbles 2 to 10 millimeters in diameter; medium acid; abrupt wavy boundary.
A12—4 to 10 inches; brown (7.5YR 5/4) loam, dark brown (7.5YR 3/4) moist; moderate medium and coarse subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine roots; many very fine tubular pores; few thin clay films on peds, in pores, and bridging mineral grains; 2 percent pebbles 2 to 10 millimeters in diameter; medium acid; abrupt wavy boundary.
B21t—10 to 34 inches; strong brown (7.5YR 5/6) clay, brown (7.5YR 5/4) moist; strong medium, coarse, and very coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; common thin and moderately thick clay films on peds and in pores; few slickensides; slightly acid; clear wavy boundary.
B22t—34 to 42 inches; reddish yellow (7.5YR 6/6) clay loam, dark brown (7.5YR 4/4) moist; common fine and medium distinct yellowish red (5YR 4/6) mottles; weak coarse and very coarse prismatic structure; very hard, firm, sticky and plastic; few very fine roots; few very fine tubular pores; common thin and few moderately thick clay films on peds and in pores; common slickensides; 5 percent pebbles 2 to 20 millimeters in diameter; neutral; clear wavy boundary.
IIB3—42 to 51 inches; reddish yellow (7.5YR 6/6) sandy clay loam, dark brown (7.5YR 4/4) moist; common fine and medium distinct yellowish red (5YR 4/6) mottles; weak fine, medium, and coarse angular blocky structure; hard, firm, sticky and plastic; few very fine tubular pores; common slickensides; 10 percent pebbles 2 to 25 millimeters in diameter; neutral; clear wavy boundary.
IIIC—51 to 63 inches; light yellowish brown (10YR 6/4) clay loam, brown (10YR 5/3) moist; common fine distinct yellowish red (5YR 4/6) mottles; massive; very hard, firm, sticky and plastic; few very fine tubular pores; moderately alkaline.

Thickness of the solum is 40 to 60 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 6 and 20 inches is dry in all parts from July 1 to September 30 and is moist in all parts from January 1 to April 15. Reaction is medium acid to neutral throughout the A and B2t horizons and is neutral to moderately alkaline in the horizon.

The A horizon has color of 7.5YR 5/4 or 6/4 or of 10YR 6/4 or 7/4. Moist color is 7.5YR 3/4 or 4/4 or 10YR 3/3, 3/4, or 4/3. Organic matter content is 0.25 to 1.0 percent below a depth of 8 inches.

The B2t horizon has color of 7.5YR 5/4, 5/6, 6/4, or 6/6 or of 10YR 6/4. Moist color is 7.5YR 4/4, 5/4, or 5/6 or 10YR 6/3. Some pedons do not have mottles. The horizon is clay loam or clay and has 35 to 55 percent clay. Some pedons do not have a B3 horizon.

The C horizon has color of 7.5YR 6/4 or 6/6 or of 10YR 6/4. Moist color is 7.5YR 5/4 or 5/6 or 10YR 5/3 or 6/3. Some pedons do not have mottles.

Wappo Variant

The Wappo Variant consists of very deep, moderately well drained soils on terraces. These soils formed in alluvium derived from mixed sources. Slope is 2 to 8 percent.

Soils of the Wappo Variant are fine, montmorillonitic, thermic Mollic Palexeralfs.

Typical pedon of Wappo Variant clay loam, 2 to 8 percent slopes, about 1,200 feet north on Pyle Road from its intersection with State Highway 20, then about 50 feet west of the road; 2,100 feet north and 1,200 feet east of the southwest corner of sec. 21, T. 15 N., R. 9 W., Bartlett Mountain quadrangle.

A1—0 to 4 inches; yellowish red (5YR 5/6) clay loam, dark reddish brown (5YR 3/4) moist; weak medium and coarse subangular blocky structure parting to weak fine and medium granular; slightly hard, friable, slightly sticky and plastic; common very fine roots; common fine and medium interstitial pores and many very fine, common fine, and few medium tubular pores; 5 percent pebbles 2 to 20 millimeters in diameter; slightly acid; abrupt smooth boundary.

B21t—4 to 15 inches; yellowish red (5YR 5/6) clay, yellowish red (5YR 4/6) moist; strong medium and coarse prismatic structure; hard, firm, sticky and plastic; common very fine roots; common very fine tubular pores; few thin clay films bridging mineral grains and colloidal stains on mineral grains; 5 percent pebbles 2 to 15 millimeters in diameter; medium acid; abrupt smooth boundary.

IIB22t—15 to 31 inches; yellowish red (5YR 5/6) gravelly clay loam, yellowish red (5YR 4/6) moist; massive; hard, firm, sticky and plastic; few very fine roots; many very fine tubular pores; many thin to thick clay films bridging mineral grains and in pores and colloidal stains on mineral grains; 20 percent pebbles 2 to 25 millimeters in diameter; slightly acid; clear smooth boundary.

IIIB23t—31 to 84 inches; yellowish red (5YR 5/6) very gravelly clay loam, yellowish red (5YR 4/6) moist; massive; hard, firm, sticky and plastic; few very fine roots; common very fine tubular pores; many moderately thick and thick clay films bridging mineral grains and in pores and colloidal stains on mineral grains; 60 percent pebbles 2 to 40 millimeters in diameter; neutral.

Thickness of the solum and depth of the profile are more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 20 inches is dry in all parts from July 1 to October 15 and is moist in all parts from December 1 to April 15. Reaction is medium acid to neutral throughout the profile.

The A horizon has color of 5YR 5/6, of 7.5YR 4/6, 5/3, or 7/4, of 10YR 4/2, 5/2, or 6/6, or of 2.5Y 4/2 or 5/2. Moist color is 5YR, 7.5YR, or 10YR 3/3, 3/4, or 4/3. Only the upper 0 to 6 inches of the A horizon has moist value of 3. The horizon is 5 to 15 percent pebbles.

The B2t horizon has color of 5YR 5/4, 5/6, 5/8, or 6/8 or of 7.5YR 7/4. Moist color is 5YR or 7.5YR 4/6 or 5/6. The horizon is clay loam, silty clay loam, silty clay, clay, gravelly clay loam, gravelly silty clay loam, gravelly silty clay, gravelly clay, very gravelly clay loam, very gravelly silty clay loam, very gravelly silty clay, or very gravelly clay. Clay content is 35 to 55 percent in the upper 20 inches of the argillic horizon. Content of rock fragments ranges from 5 to 35 percent in the upper 20 inches of the argillic horizon, but is as much as 60 percent in the lower part of the B2t horizon; fragments are pebbles and cobbles.

Whispering Series

The Whispering series consists of moderately deep, well drained soils on hills and mountains. These soils formed in material weathered from andesite, basalt, or dacite. Slope is 5 to 75 percent.

Soils of the Whispering series are loamy-skeletal, mixed, mesic Ultic Haploxeralfs.

Typical pedon of a Whispering loam in an area of Collayomi-Aiken-Whispering complex, 5 to 30 percent slopes, 10 feet east of Road 550, 0.2 mile southeast of its intersection with road 551, Boggs Mountain State Forest; 1,175 feet south and 1,400 feet west of the northeast corner of sec. 13, T. 11 N., R. 8 W., Whispering Pines quadrangle.

O1—1 inch to 0; pine litter.

A1—0 to 5 inches; brown (7.5YR 5/4) loam, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure parting to moderate medium granular; soft, very friable, nonsticky and nonplastic; weakly smeary; many very fine and fine roots and common medium roots; many very fine and fine and common medium interstitial pores; 10 percent pebbles 2 to 75 millimeters in diameter; slightly acid; abrupt wavy boundary.

B1t—5 to 15 inches; reddish yellow (5YR 6/6) gravelly loam, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure; soft, very friable, slightly sticky and slightly plastic; weakly smeary; many very fine and fine roots and common medium and coarse roots; common very fine and few fine interstitial pores and few fine tubular pores; few thin clay films in pores and on peds; 20 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 145 millimeters in diameter; medium acid; clear wavy boundary.

B2t—15 to 26 inches; yellowish red (5YR 5/6) very cobbly clay loam, reddish brown (5YR 4/4) moist; moderate medium and coarse subangular blocky

structure; slightly hard, friable, sticky and slightly plastic; moderately smeary; few very fine, fine, and medium roots; common very fine interstitial pores; common moderately thick clay films on peds and in pores; 15 percent pebbles 2 to 75 millimeters in diameter and 30 percent cobbles 75 to 200 millimeters in diameter; medium acid; abrupt irregular boundary.

R—26 inches; hard, highly fractured andesite; fractures are 1 to 10 millimeters wide and 50 to 200 millimeters apart.

From 0 to 10 percent of the surface is covered with stones and boulders. Depth to a lithic contact is 20 to 40 inches. The mean annual soil temperature is 49 to 54 degrees F. The part of the profile between depths of 7 and 21 inches is moist in all parts from December 15 to April 30 and is dry in all parts from July 15 to October 15. Mineralogy is influenced by amorphous material. The base saturation (sum of cations) is 50 to 75 percent and decreases as depth increases. Organic matter content is 0.25 to 1.0 percent below a depth of 7 inches.

The A horizon has color of 7.5YR 5/4 or 6/4 or of 5YR 5/4. Moist color is 5YR 3/3 or 3/4. Pebble content is 5 to 15 percent, and cobble content is 0 to 10 percent. Reaction is neutral or slightly acid.

The B2t horizon has color of 5YR 5/6, 6/4, or 6/6. Moist color is 5YR 3/3, 3/4, or 4/4. The horizon is very gravelly or very cobbly clay loam. It is 27 to 35 percent clay. Rock fragments consisting of pebbles and cobbles commonly make up 35 to 55 percent of the upper 20 inches. Reaction is slightly acid or medium acid.

Wolfcreek Series

The Wolfcreek series consists of very deep, well drained soils on flood plains. These soils formed in alluvium derived from mixed sources. Slope is 0 to 2 percent.

Soils of the Wolfcreek series are fine-loamy, mixed, nonacid, thermic Typic Xerofluvents.

Typical pedon of Wolfcreek loam, about 4,000 feet south on Live Oak Drive from its intersection with State Highway 29, then about 50 feet west of the road; 1,000 feet south and 1,500 feet east of the northwest corner of sec. 23, T. 13 N., R. 9 W., Kelseyville quadrangle.

Ap—0 to 7 inches; pale brown (10YR 6/3) loam, dark brown (10YR 4/3) moist; weak medium, coarse, and very coarse subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; common very fine and fine roots and few medium roots; many very fine, fine, medium, and coarse tubular pores and few very fine, fine, and medium interstitial pores; neutral; gradual wavy boundary.

C1—7 to 34 inches; brown (10YR 5/3) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium and coarse prismatic structure parting to moderate medium angular blocky; hard, firm, sticky and plastic; common very fine and fine roots and few medium roots; common very fine and fine tubular pores and common very fine and fine interstitial pores; neutral; gradual wavy boundary.

IIC2—34 to 46 inches; brown (10YR 5/3) sandy clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, slightly sticky and plastic; common very fine and medium roots; common very fine and fine tubular pores and many very fine and fine interstitial pores; neutral; gradual wavy boundary.

IIIC3—46 to 72 inches; brown (10YR 5/3) very gravelly sandy clay loam, very dark grayish brown (10YR 3/2) moist; massive; hard, firm, slightly sticky and plastic; few very fine and fine roots; many very fine, fine, and medium interstitial pores and common very fine and fine tubular pores; 60 percent pebbles; neutral.

Thickness of the solum is 6 to 12 inches, and depth of the profile is more than 60 inches. The mean annual soil temperature is 59 to 63 degrees F. The part of the profile between depths of 6 and 17 inches is dry in all parts from June 15 to October 15 and is moist in all parts from January 1 to April 15.

The A horizon has color of 7.5YR 6/2 or 6/4 or of 10YR 6/2, 6/3, or 6/4. Moist color is 7.5YR 4/2 or 4/4 or 10YR 4/2, 4/3, or 4/4. The horizon is loam or gravelly loam with 0 to 30 percent pebbles. Organic carbon content decreases irregularly as depth increases.

The C horizon has color of 7.5YR 5/4, 6/2, or 6/4 or of 10YR 5/3, 5/4, or 6/3. Moist color is 7.5YR 3/4, 4/2, or 4/4 or 10YR 3/2, 3/3, or 4/3. It is stratified sandy clay loam, loam, clay loam, gravelly sandy loam, very gravelly sandy clay loam, very gravelly clay loam, or extremely gravelly sandy loam. The particle-size control section averages 20 to 35 percent clay and 0 to 25 percent pebbles. A very gravelly or extremely gravelly layer is below a depth of 40 inches.

Xerofluvents

Xerofluvents are very deep, excessively drained soils on narrow flood plains. They formed in coarse textured alluvium derived from mixed sources. Slope is 0 to 2 percent.

Reference pedon of Xerofluvents, very gravelly, about 1,200 feet north on Dry Creek Cutoff from its intersection with Dry Creek Road, then 200 feet east onto creek bed; Lat. 38°44'47' N., Long. 122°37'52' W. (in an unsectionalized area), Mount St. Helena quadrangle.

A1—0 to 5 inches; grayish brown (10YR 6/2) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; loose, very friable, slightly sticky and slightly plastic;

common very fine and few medium roots; many very fine and fine interstitial pores; 35 percent pebbles 2 to 75 millimeters in diameter and 7 percent cobbles 75 to 150 millimeters in diameter; mildly alkaline; clear wavy boundary.

IIC1—5 to 29 inches; light brownish gray (10YR 6/2) very gravelly loamy coarse sand, dark gray (10YR 4/1) moist; massive; soft, very friable, nonsticky and nonplastic; common very fine and few fine roots; common very fine and fine interstitial pores and few medium tubular pores; 45 percent pebbles 2 to 75 millimeters in diameter and 15 percent cobbles 75 to 150 millimeters in diameter; moderately alkaline; gradual broken boundary.

IIIC2—29 to 42 inches; light brownish gray (10YR 6/2) very gravelly loamy coarse sand, dark gray (10YR 4/1) moist; massive; soft, very friable, nonsticky and nonplastic; few very fine, fine, and medium roots; many very fine and fine interstitial pores; 35 percent pebbles 2 to 50 millimeters in diameter; moderately alkaline; clear wavy boundary.

IVC3—42 to 84 inches; light brownish gray (10YR 6/2) very gravelly coarse sand, dark gray (10YR 4/1) moist; massive; soft, very friable, nonsticky and nonplastic; few coarse roots; common very fine, fine, and medium interstitial pores; 40 percent pebbles 2 to 75 millimeters in diameter and 7 percent cobbles 75 to 150 millimeters in diameter; moderately alkaline.

The profile is more than 60 inches deep. Reaction is slightly acid to moderately alkaline throughout the profile. Most pedons have 35 to 75 percent rock fragments throughout. Rock fragments are dominantly pebbles and cobbles.

The A and C horizons have hue of 10YR. Dark colors and high organic matter content are not common below a depth of 10 inches. Texture is gravelly, cobbly, very gravelly, very cobbly, or extremely gravelly coarse sand, loamy sand, loamy coarse sand, or sandy loam. The horizons are stratified, and thin layers of sand are present in some pedons. The soils are subject to occasional to frequent periods of flooding in winter and spring.

Yollabolly Series

The Yollabolly series consists of shallow, excessively drained soils on mountains. These soils formed in material weathered from metamorphosed sandstone. Slope is 30 to 75 percent.

Soils of the Yollabolly series are loamy-skeletal, mixed, nonacid, frigid Lithic Xerorthents.

Typical pedon of a Yollabolly very gravelly loam in an area of Yollabolly-Freezeout very gravelly sandy loams, 30 to 50 percent slopes, on Boardman Ridge, near the top of Hull Mountain in the Mendocino National Forest; 2,150 feet north and 850 feet east of the southwest corner of sec. 11, T. 19 N., R. 10 W., Hull Mountain quadrangle.

A1—0 to 5 inches; brown (10YR 4/3) very gravelly sandy loam, very dark grayish brown (10YR 3/2) moist; weak very fine and fine granular structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots; many very fine, fine, and medium interstitial pores; 50 percent pebbles 2 to 75 millimeters in diameter; strongly acid; clear wavy boundary.

C—5 to 14 inches; pale brown (10YR 6/3) extremely gravelly sandy loam, brown (10YR 4/3) moist; single grain and weak very fine and fine granular structure; loose, very friable, nonsticky and nonplastic; common fine, medium, and coarse roots and few very fine roots; many very fine, fine, and medium interstitial pores; 65 percent pebbles 2 to 75 millimeters in diameter and 10 percent cobbles 75 to 175 millimeters in diameter; very strongly acid; abrupt smooth boundary.

R—14 to 17 inches; hard, fractured metamorphosed sandstone; fractures are 75 to 150 millimeters apart and 1 to 10 millimeters wide.

Depth to a lithic contact is 10 to 20 inches. Changes in depth occur erratically over a span of less than 2 feet. The mean annual soil temperature is 44 to 47 degrees F. The part of the profile just above the bedrock is dry in all parts from July 25 to October 1 and is moist in all parts from November 25 to June 1. Angular and subangular rock fragments of various sizes and amounts form a surface layer. Rock fragments make up 35 to 65 percent of the profile. The soils are very gravelly or extremely gravelly loam or sandy loam.

The A horizon has color of 10YR 4/2, 4/3, 5/2, or 6/2. Moist color is 10YR 3/2, 3/3, 4/2, or 4/3. Reaction is medium acid to very strongly acid.

The C horizon is 10YR or 2.5Y 6/2, 6/3, 6/4, 7/3, or 7/4. Moist color is 10YR or 2.5Y 4/3, 4/4, or 5/3.

Yorktree Series

The Yorktree series consists of deep, well drained soils on hills and mountains. These soils formed in material derived from graywacke, schist, or shale. Slope is 15 to 50 percent.

Soils of the Yorktree series are fine, mixed, mesic Ultic Argixerolls.

Typical pedon of a Yorktree clay in an area of Yorktree-Hopland-Squawrock complex, 15 to 50 percent slopes, about 15 feet southwest of Road 1N02 and 0.3 mile from its intersection with the Potter Valley-Lake Pillsbury Roads, Mendocino National Forest; 400 feet north and 1,050 feet east of the southwest corner of sec. 15, T. 18 N., R. 10 W., Lake Pillsbury quadrangle.

A11—0 to 4 inches; grayish brown (10YR 5/2) clay loam, black (10YR 2/1) moist; strong very fine and fine granular structure; slightly hard, very friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine and common medium interstitial pores; 10 percent pebbles 2 to 5 millimeters in diameter; neutral; clear wavy boundary.

A12—4 to 8 inches; grayish brown (10YR 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong very fine and fine granular structure; slightly hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine and common medium interstitial pores; 5 percent pebbles 2 to 15 millimeters in diameter; slightly acid; gradual wavy boundary.

B1—8 to 14 inches; grayish brown (2.5Y 5/2) clay loam, very dark grayish brown (10YR 3/2) moist; strong very fine, fine, and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; many very fine roots, common fine and medium roots, and few very coarse roots; common very fine and fine interstitial pores; 5 percent pebbles 2 to 15 millimeters in diameter; slightly acid; gradual wavy boundary.

B21t—14 to 24 inches; grayish brown (2.5Y 5/2) clay loam, dark brown (10YR 4/3) moist; strong very fine, fine, and medium subangular blocky structure; very hard, firm, very sticky and plastic; many very fine and fine interstitial pores; 5 percent pebbles 2 to 15 millimeters in diameter; medium acid; gradual wavy boundary.

B22t—24 to 34 inches; olive gray (5Y 5/2) gravelly clay, dark gray (10YR 4/1) moist; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and plastic; few very fine, fine, and medium roots; few very fine interstitial pores; 25 percent pebbles 2 to 15 millimeters in diameter; medium acid; clear wavy boundary.

B23t—34 to 48 inches; dark gray (5Y 4/1) gravelly clay, variegated very dark gray (10YR 3/1) and yellowish brown (10YR 5/6) moist; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few very fine interstitial pores; 15 percent pebbles 2 to 10 millimeters in diameter; mildly alkaline; gradual wavy boundary.

B24t—48 to 55 inches; very dark gray (N 3/0) gravelly clay, black (5Y 2.5/1) moist; moderate medium angular blocky structure; very hard, very firm, very sticky and plastic; few fine roots; few very fine interstitial pores; 15 percent pebbles 2 to 15 millimeters in diameter; mildly alkaline; abrupt irregular boundary.

R—55 inches; hard, fractured graywacke.

Thickness of the solum and depth to a lithic contact are 40 to 60 inches. The mean annual soil temperature is 55 to 59 degrees F. The part of the profile between depths of 6 and 15 inches is dry in all parts from June 15 to October 15 and is moist in all parts from December 1 to April 15. A stone line occurs in most pedons between depths of 10 and 24 inches. The particle-size control section is 15 to 30 percent pebbles and 5 to 15 percent cobbles.

The A horizon has color of 10YR 5/2, 5/3, 4/2, or 4/3. Moist color is 10YR 3/2 or 3/3. Reaction is medium acid to neutral.

The B2t horizon has color of 10YR 6/3, 5/3, 5/4, or 4/5 or of 7.5YR 5/2 or 5/4. Moist color is 10YR 3/3, 4/2, 4/3, or 4/4 or 7.5YR 3/4 or 4/4. The horizon is clay loam, clay, gravelly clay loam, or gravelly clay and has 35 to 50 percent clay and 5 to 35 percent rock fragments consisting of pebbles and cobbles. The horizon is medium acid to mildly alkaline. Base saturation (sum of cations) is 50 to 85 percent and is less than 75 percent in some part.

The Yorktree soils in this survey area have gray colors in the B horizon, which is outside the range defined for the series. This difference, however, does not significantly affect their use and management.

Yorkville Series

The Yorkville series consists of very deep, moderately well drained soil on hills and mountains. These soils formed in material weathered from schist, graywacke, or shale. Slope is 15 to 50 percent.

Soils of the Yorkville series are fine, mixed, thermic Typic Argixerolls.

Typical pedon of a Yorkville clay loam in an area of Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes, about 1,000 feet south on private road from its junction with Forest Road 20N01 and County Road 301, then 30 feet west of road, in the Mendocino National Forest; 1,850 feet south and 900 feet east of the northwest of corner of sec. 15, T. 18 N., R. 10 W., Lake Pillsbury quadrangle.

A1—0 to 3 inches; dark gray (10YR 4/1) clay loam, very dark gray (10YR 3/1) moist; strong fine and medium granular structure; hard, friable, slightly sticky and slightly plastic; many very fine and fine roots; many very fine and fine interstitial pores and few very fine and fine tubular pores; 5 percent pebbles 2 to 25 millimeters in diameter; mildly alkaline; clear wavy boundary.

B21t—3 to 18 inches; dark gray (10YR 4/1) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, firm, sticky and plastic; common very fine and fine roots; common very fine and fine interstitial pores; common moderately thick clay films on peds; 3

percent pebbles 2 to 20 millimeters in diameter; mildly alkaline; gradual wavy boundary.

B22t—18 to 33 inches; gray (10YR 5/1) clay, dark grayish brown (10YR 4/2) moist; moderate medium subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine and few fine interstitial pores; common moderately thick clay films on peds; 1 percent pebbles 2 to 20 millimeters in diameter; mildly alkaline; gradual wavy boundary.

B23t—33 to 64 inches; gray (10YR 5/1) gravelly clay loam, dark gray (10YR 4/1) moist; moderate medium and coarse subangular blocky structure; very hard, firm, sticky and plastic; few very fine roots; common very fine and few fine interstitial pores; common moderately thick clay films on peds; 15 percent pebbles 2 to 50 millimeters in diameter; moderately alkaline; abrupt irregular boundary.

Cr—64 inches; soft, fractured schist; fractures are 1 to 10 millimeters wide and 75 to 150 millimeters apart.

The thickness of the solum and depth to a lithic contact are 60 inches or more. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 3 and 10 inches is dry in all parts from June 1 to October 1 and is moist in all parts from December 1 to April 1. Mineralogy is high in chlorite, vermiculite, and mica.

The A horizon has color of 10YR 5/3, 5/2, 4/3, 4/2, 4/1, or 3/3 or of 2.5Y 5/2 or 4/2. Moist color is 10YR 3/3, 3/2, or 3/1 or 2.5Y 3/2. Reaction is slightly acid to mildly alkaline.

The B2t horizon has color of 10YR 5/3, 5/2, 5/1, 4/3, 4/2, or 4/1 or of 2.5Y 5/4 or 5/2. Moist color is 10YR 4/1, 3/2, or 3/1 or 2.5Y 3/2. The horizon is clay loam, clay, gravelly clay loam, or gravelly clay and has 35 to 50 percent clay and 0 to 20 percent pebbles. It is neutral to moderately alkaline.

Some pedons have a B3t, B3, or C horizon that is similar to the B2t horizon in color and texture.

Yorkville Variant

The Yorkville Variant consists of very deep, well drained soils on alluvial fans and toe slopes. These soils formed in alluvium or colluvium derived dominantly from serpentinitic rock. Slope is 2 to 8 percent.

Soils of the Yorkville Variant are fine, mixed, thermic Typic Argixerolls.

Typical pedon of Yorkville Variant clay loam, 2 to 8 percent slopes, 1,400 feet north of State Highway 175, at a point 1.3 miles west of intersection with Dry Creek Cutoff; 700 feet north and 2,225 feet east of the southwest corner of sec. 29, T. 11 N., R. 7 W., Whispering Pines quadrangle.

Ap—0 to 8 inches; reddish brown (5YR 4/4) clay loam, dark reddish brown (5YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable, sticky and slightly plastic; common fine and very fine roots; common very fine and fine tubular pores; 4 percent pebbles 2 to 10 millimeters in diameter; mildly alkaline; abrupt wavy boundary.

IIB21t—8 to 31 inches; dark reddish brown (5YR 4/4) gravelly sandy clay, dark reddish brown (5YR 3/4) moist; weak fine and medium subangular blocky structure; slightly hard, friable, sticky and plastic; common very fine and fine roots; common very fine and fine tubular pores and common very fine and fine interstitial pores; common moderately thick clay films on peds and rock fragments; 30 percent pebbles 2 to 75 millimeters in diameter; moderately alkaline; clear wavy boundary.

IIIB22t—31 to 51 inches; yellowish red (5YR 5/6) clay, dark reddish brown (5YR 3/4) moist; weak very fine, fine, and medium subangular blocky structure; very hard, firm, sticky and plastic; common fine interstitial pores; common moderately thick and thick clay films on peds and in pores; 12 percent angular serpentine rock fragments 2 to 10 millimeters in diameter; mildly alkaline; clear irregular boundary.

IIIB23t—51 to 62 inches; brown (7.5YR 5/4) clay, dusky red (2.5YR 3/2) moist; weak medium and coarse prismatic structure; very hard, firm, sticky and plastic; few fine interstitial pores; many thick clay films on peds; 2 percent pebbles 2 to 5 millimeters in diameter; mildly alkaline; clear wavy boundary.

IIIC1—62 to 71 inches; brownish yellow (10YR 6/6) sandy clay loam, dark brown and brown (10YR 4/3) moist; few fine black stains; massive; hard, friable, slightly sticky and plastic; few fine interstitial pores; few thin clay films bridging mineral grains; 1 percent pebbles 1 to 5 millimeters in diameter; moderately alkaline.

Thickness of the solum is 40 to 65 inches, and the profile is more than 60 inches deep. The mean annual soil temperature is 59 to 62 degrees F. The part of the profile between depths of 5 and 19 inches is dry in all parts from July 1 to October 15 and is moist in all parts from January 1 to April 15. Reaction is neutral to moderately alkaline. The calcium to magnesium ratio is 2:1 to 1:5. The profile has 1 to 3 percent organic matter in the upper 10 inches and decreases regularly to less than 1 percent below a depth of 20 inches.

The A horizon has color of 2.5YR, 5YR, or 7.5YR 4/4. Moist color is 2.5YR, 5YR, or 7.5YR 3/3.

The B2t horizon has color of 2.5YR 3/4, of 5YR 3/4, 4/4, or 3/6, or of 7.5YR 5/4. Moist color is 2.5YR 3/2 or 4/4, 5YR 3/3 or 3/4, or 7.5YR 5/4. Moist value and chroma of 3 or less occur only in the upper 10 inches of the B2t horizon. The horizon is clay loam, clay, sandy clay, gravelly clay loam, gravelly clay, or gravelly sandy clay and has 35 to 50 percent clay and 2 to 30 percent pebbles.

Formation of the Soils

In this section the factors that affect the formation of the soils in the survey area are discussed and important processes in morphology are described.

Soil is a natural body that covers the land surface of the earth in a thin layer and serves as a medium for plant growth. It is composed of mineral and organic matter, water, and air. Soils differ in their appearance, composition, productivity, and management requirements in different localities and even within short distances. The influence and interaction of the genetic and environmental factors under which the soils form cause the differences. The major factors are (1) the physical and chemical composition of the parent material; (2) the climate; (3) the biological forces that act upon the soil material; (4) the topography, or lay of the land; and (5) the length of time the forces of formation have acted on the soil material.

Each of the soil-forming factors affects the formation of every soil, and each modifies the effects of the other four. Climate and plants and animals are the active forces of soil formation. They act upon parent material that has accumulated through the weathering of rocks and slowly change it into soil. Relief modifies the effects of climate and biological factors, mainly by its influence on temperature and runoff. Time is needed for distinct soil horizons to form. In the paragraphs that follow, the influence of each soil-forming factor on the soils of Lake County is discussed.

Parent Material

Parent material is the unconsolidated mineral and organic material in which soils form (*28*). Most of the mineral matter in which soils form is derived from rock. Several characteristics of parent material strongly affect the kind of soil that is formed. These are mineralogical composition, hardness and degree of consolidation, grain size, and amount of salts.

In Lake County, soils have formed in both residual and transported parent material. Residual parent material is derived through disintegration and decomposition of the underlying rock contained in various geological formations. Transported parent material is soil and rock fragments that have been removed from their place of origin through the erosive properties of water, wind, gravity, or other physical forces and then deposited in another location. Alluvial, colluvial, and lacustrine deposits are examples of transported parent material.

Lake County covers a variety of geological formations of igneous, metamorphic, and sedimentary origin. The formations differ greatly in age, hardness, and resistance to weathering. These lithologic differences significantly affect the landscape as well as the characteristics of soils.

The oldest exposed rocks in Lake County are in the northeastern part of the county (*18, 19*). They are pre-Cretaceous metasedimentary rocks consisting of mica-quartz schist and slate. These rocks were deposited about 225 million years ago. They are hard and fine-grained. Slopes in the area are steep, and colluvial movement is common. The soils in this area tend to be shallow or moderately deep, are in a loamy-skeletal particle-size class, and are excessively dusty when subjected to vehicular traffic. Sheetiron and Deadwood soils are in this area.

The Jurassic-Cretaceous aged Fransiscan Formation underlies most of the northern and western parts of the survey area. It is sedimentary in origin and consists largely of sandstone, graywacke, shale, and chert with small local areas of greenstone, schist, basalt, and related metamorphic rocks. These rocks vary widely in lithologic properties; thus, the soils that are derived from them differ substantially in characteristics. Soils derived from medium hard sandstone, graywacke, and shale tend to be in fine-loamy or fine particle-size classes and are moderately deep to very deep. Bressa, Kekawaka, Sanhedrin, Sleeper, and Speaker soils are examples. In local areas of hard metamorphosed sandstone, shale, greenstone, or chert, soils in the loamy-skeletal particle-size class have formed. Bamtush, Freezeout, Mayacama, and Neuns soils are in this group. Rock outcroppings are common in these areas. Shallow soils such as those of the Maymen and Etsel series have developed in many areas of the Fransiscan Formation, largely because of the influence of climate and topography, which will be discussed later.

The Fransiscan Formation owes its distinctive chemical and physical properties to geological processes, such as plate convergence and subduction, which are associated with sea-floor spreading and continental drift. A trench and subduction zone is inferred to have existed off the west coast of North America some 90 to 150 million years ago. The rapid lateral and vertical changes in rock type so characteristic of the Fransiscan Formation are the result of these rocks

having been carried into and beneath the western edge of the continent and severely disrupted, sheared, and metamorphosed to various degrees in the process. Subsequent uplift has exposed this patchwork of rocks.

The Knoxville, Martinez, and Tejon Formations and undifferentiated Cretaceous rocks occupy a small area of the county near Lower Lake. These rocks consist dominantly of sandstone, shale, and conglomerate. The soils derived from these materials are similar to those in the Fransiscan Formation.

Scattered throughout the county are areas of Mesozoic ultrabasic intrusive rock, mostly serpentinite and peridotite. These rocks are composed predominantly of the mineral serpentine, which forms as an alternation product of magnesium silicates such as pyroxenes and olivine (*25*). They commonly are soft, fine-grained rocks that are high in content of iron and magnesium. The Dubakella, Henneke, Montara, and Okiota soils formed in parent material derived from these rocks. These soils tend to be red because of the iron content of the parent material and to be less fertile than those derived from sedimentary rocks because the parent material contains large amounts of magnesium in proportion the amount of calcium. Excess magnesium seriously reduces the amount of calcium taken up by plants, which results in a calcium deficiency.

Intensive volcanism occurred south and southwest of Clear Lake during the relatively recent Pleistocene and Holocene Epochs. The Clear Lake volcanic series includes a diverse assortment of extrusive rocks, varying from olivine basalt to rhyolitic obsidian. The main kinds of rock are andesite and dacite (*9*). The volcanic field is composed of scattered lava domes, cinder cones, massive flows, and pyroclastic debris. The flows dominate the area, with Boggs Mountain, Cobb Mountain, Mount Hanna, and Mount Konocti as source vents. Many other flows have resulted from fissure eruptions. The flows and domes vary in age and rock composition, which influence the nature of the parent material and corresponding soil development. Obsidian flows give rise to the silica-rich parent material from which Arrowhead, Bottlerock, and Glenview soils are derived. These soils tend to be fine textured and erodible.

Soils that formed in andesite, basalt, and dacite vary in characteristics largely because of the age of the parent material and the topography and climatic conditions during formation. In the vicinity of Lower Lake and Middletown, the soils that formed in material derived from these rocks are dominantly shallow or moderately deep and are in a fine-loamy or fine particle-size class. Hambright, Guenoc, and Sobrante soils are examples. In other areas soils range from shallow to very deep and are in a loamy-skeletal to fine particle-size class. Aiken, Benridge, Collayomi, Konocti, Sodabay, and Whispering soils are examples. Some of these soils formed under conditions resulting in rapid weathering of the aforementioned rocks or in pyroclastic ash, tuff, or breccia, which generally are highly weatherable. They are well developed and support productive timber stands and dryland walnut orchards. Soils derived from volcanic rock may have a large amount of amorphous minerals, which tie up phosphorus and render it unavailable to plants. Crops grown on these soils may require phosphorous fertilizer.

The Cache Formation is a sequence of transported freshwater sediments that were subsequently uplifted and dissected to form the hills east of Clearlake Highlands. Bally and Phipps soils formed in parent material derived from these highly weatherable, unconsolidated sediments. These soils are very deep, have a clay subsoil, and are subject to extensive geologic erosion.

The bottom lands and low terraces of the county are Quaternary fluvial and lacustrine deposits. The soils in these areas are all very deep but vary in texture and other characteristics. The low terraces near Lakeport are the dissected remains of an older alluvial surface, apparently graded to a higher lake level. The Forbesville, Wappo, and Manzanita soils on the terraces are very deep and have a well developed argillic horizon. Many areas on the alluvial bottom lands are subject to periodic flooding and deposition of alluvium. Kelsey and Talmage soils are examples of soils derived from coarse-grained alluvium deposited relatively recently near streams and creeks. The coarse-loamy and loamy-skeletal particle-size classes of these soils and their degree of development reflect the nature of this parent material. Lupoyoma and Still soils formed in fine-grained alluvium deposited farther from the stream source. They are in fine-silty or fine-loamy particle-size classes but do not exhibit significant profile development. Lacustrine deposits are composed of very fine sediment that settles out of nonmoving bodies of water in lakes and basins. Soils derived from this material generally have slow permeability and high shrink-swell capacity because of the high content of clay. Clear Lake, Cole, and Tulelake soils are examples.

Climate

The climate, or the amount and distribution of heat and moisture received, has a marked influence on the kinds of soil that form. Heat and moisture influence the amount and kind of vegetation, the rate at which organic matter decomposes, the rate at which minerals weather, and the removal or accumulation of material in the different soil horizons.

There are a few different climatic regions in the county, although the transition between the regions is gradual. These regions are valleys that generally are surrounded by foothills and mountains, as in the Lakeport, Middletown, and Upper Lake areas; foothills, as in the eastern and southern parts of the county; and

the higher elevations, which are the rugged mountains of the northern and western parts of the county.

Generally, summers are warm and dry and winters are cool and moist. There is a substantial difference in temperature and precipitation from one area to another In the valleys and foothills, the mean annual temperature is about 53 to 60 degrees F. In the mountains, the mean annual temperature is about 45 to 53 degrees. Most of the precipitation falls from November through April. Annual precipitation ranges from a low of about 24 inches in the valleys of Clear Lake Basin to about 70 inches in the highest mountains. Snowfall ranges from a seasonal average of 0.5 inch at Lakeport to more than 55 inches on the highest mountain peaks. Detailed climatic data for the county are given in the section "General Nature of the Survey Area."

In the valleys and lower foothills, where rainfall is moderate and summers are hot and dry, the soils tend to be moderately high in content of bases and are well oxidized. Plant growth, mainly grasses, brush, and hardwood trees, is rapid in spring but decreases rather abruptly with the onset of summer weather. The soils become dry during this period. On the bottom lands large amounts of organic matter are deposited by vegetation growing on the soils and carried by runoff from surrounding hills. These soils have a thick, dark-colored surface layer. On the foothills the oxidation of organic matter during warm, dry summers and the short growing period permit little accumulation of organic matter. Soils on the foothills generally do not have a thick, dark-colored surface layer.

In the mountains the effects of high precipitation and lower temperatures are evident in the vegetation and soils. Coniferous trees along with other woody and herbaceous vegetation are more abundant. The soils commonly have a relatively thin, dark-colored surface layer underlying a layer of leaves, twigs, and bark. Oxidation of organic matter is rapid during warm, dry periods, as on the foothills; thus, accumulation of organic matter in the soil profile usually is not substantial. In many places rainfall is sufficient to leach bases from the soils and reduce the soil reaction. These soils commonly are slightly acid to very strongly acid. Areas above 5,000 feet in elevation have the highest precipitation and the coolest temperatures in the county. Soils in these areas have a thick, dark-colored surface layer but are very low in bases because there is less oxidation of organic matter and more leaching of bases.

Warm temperatures in spring, while the soils are moist, increase the rate of soil formation. The warm temperatures increase the rate of chemical reactions, and percolating water from spring rains leaches out soluble materials and relocates suspended material in the soil profile. The remains of plants decompose rapidly, and organic acids that are produced hasten the formation and movement of clay. Soil forming processes in the county are cyclic. Weathering is relatively rapid in spring and early in summer and is slow in fall.

Generally, weathering and soil formation are more rapid at the warm, moist intermediate elevations. Soils form at a moderate rate in the warmer, drier areas. They form slowest on very warm, dry, south-facing slopes and in the colder climates of the higher elevations. Thus, climate has had a strong influence on the formation of the soils in the county, but climate alone does not account for all the local differences among the soils.

Biological Forces

Plants, animals, insects, bacteria, and fungi are the biologic forces in soil formation. They are responsible for gains in organic matter, gains and losses of nitrogen and other plant nutrients, changes in porosity and structure, and mixing of developing soil horizons. Plants have had more influence than animals on the formation of soils in Lake County.

Much of the county is dominated by brush or chaparral. Brush fields are scattered throughout the foothills and mountains of the area on warm, dry slopes, where soils are shallow and droughty. At the higher elevations in the northern half of the county and in the Cobb Mountain area, the vegetation is coniferous forest. Grass-oak vegetation is common around Clear Lake and in the southern and southeastern parts of the county.

In some places oaks are sparse and grow mainly on north-facing slopes or in drainageways. Freshwater marshes occur in small areas, mainly around Clear Lake. Generally, north-facing slopes and canyons support trees and the drier south-facing slopes support grasses, brush, or chaparral. Shrubs commonly grow on the shallow soils, or they represent a stage in plant succession following burning or clearing.

Organic matter from plants accumulates at the soil surface and is decomposed and incorporated into the soil. The physical and chemical properties of organic matter and the byproducts of its decomposition influence the color, structure, nutrient status, and other properties of the soil. In some places, especially under trees, a mat forms on the surface that is less than 1 inch to more than 5 inches thick. The mat consists of fresh and partially decomposed needles, leaves, and twigs and is acid in reaction. The acid reaction of the mat contributes to the acid reaction of the underlying mineral soil material.

In many places roots occupy more than 20 percent of the upper 2 to 3 feet of the soil. Growth and decomposition of roots tend to make the soil more porous and contribute to organic matter content. In addition, plant roots follow cracks and fracture planes in the parent rock and contribute to the physical and chemical weathering processes of soil formation. Roots also retard soil erosion and thereby facilitate the accumulation of mantles of rock debris. Plant cover

retards soil erosion by protecting the soil surface from the impact of rain drops.

Plants may also alter the effect of climate on soil formation. When the overstory shades the soil surface, the soil temperature is reduced and less moisture is lost through evaporation. The rate of chemical reactions and weathering of parent material is thereby altered.

Man has directly or indirectly disturbed the soils in the area by mining, clearing or burning the vegetation, harvesting timber, grazing livestock, and cultivating the soils. Burning has probably influenced the soils the most, since repeated fires deplete organic matter, cause erosion, and change the plant ecology. Following a fire, different plant communities are established and thus one of the soil-forming factors is altered. Man and lightning are the main causes of fire.

The effect of animals on the soils in the county is less apparent. No distinct or major soil features are attributed solely to animal activity. In some areas animal burrows have contributed to the concentration of runoff water into channels that eventually develop into extensive gullies. Burrowing animals tend to mix soil material in the profile and thus affect soil structure, porosity, and other properties. Microfauna such as bacteria and fungi are present in almost all of the soils, and they play an important role in organic matter decomposition and plant nutrient status.

Topography

Topography, or the lay of the land, affects soil formation through its influence on climate, drainage, erosion, plant cover, and soil temperature.

Elevation, aspect, slope, and position of the soil on the landscape are all part of the topography. Elevation influences soil formation mainly through its effect on precipitation and soil temperature. Aspect greatly affects local climate which, in turn, influences vegetation and other soil forming processes. Slope and the position of the soil on the landscape affect soil formation through their influence on the movement and retention of water.

Aspect, or the compass direction in which a slope faces, becomes increasingly important in the foothills and mountains. Direction and slope of the soil determine the total amount of heat energy that is absorbed from the sun. There may be a great difference in the average summer soil temperature at a depth of 20 inches between north- and south-facing slopes. Aspect can strongly affect soil characteristics and vegetation on different sides of prominent mountains or ridges. Soils on hot, dry, south-facing slopes tend to be shallow and poorly developed. They support vegetation such as annual grasses and brush, which have shallow rooting and low moisture requirements. Soils on north-facing slopes in the same vicinity might be deep and well developed and support coniferous or deciduous trees.

Soils that have very steep slopes or that are near the top of narrow ridges generally are subject to rapid runoff. Material is rapidly eroded from the surface, and only a small amount of percolation water is available for leaching and weathering. Plants grow slowly, and the effect of plants and animals on the soils is slight. In general, steeper soils are shallow and less leached and soil formation in them is weakly expressed. Very steep soils erode rapidly, are considered young even if the parent material is old, and strongly reflect the features of the parent material. Maymen-Etsel-Snook complex, 30 to 75 percent slopes, is an example of a map unit that occurs dominantly on steep, south-facing slopes. The soils are less than 20 inches deep, the organic surface layer is very thin, and little or no clay has accumulated in the subsoil.

Where the soils are very gently sloping or level, little rainfall is lost by runoff, and runoff from higher lying soils may flow onto the soils. Little soil material is lost through erosion, and alluvium may be deposited; if level, the soils are permeable and well drained and relatively large amounts of water may percolate through the soils and leach them. Where level soils are not excessively drained or leached and are moist for long periods of time, grass and grasslike plants grow abundantly. These soils are very deep and have a dark-colored surface layer that has a high organic matter content. Lupoyoma and Still soils are examples; they are among the most productive cropland soils in the county. In other soils that have a high water table, the subsoil is mottled with light gray or bluish colors caused by the reduction and transfer of iron. These soils are saturated for long periods of time and are poorly aerated unless artificially drained. Tulelake soils are an example.

Time

All soil-forming factors are interrelated, and soil properties are dependent on the length of time these factors have been interacting. The effect of time on soil formation in Lake County generally is evident in the degree of alteration of parent material by the interacting forces of climate, plants, animals, and topography. Soils are considered to be old if their horizons are distinctly different in color, texture, reaction, structure, or other properties. Generally, distinct boundaries between horizons characterize older soils. Soils that have few or indistinct horizon differences are considered to be young. Also, soils that have the greatest horizon differences are not necessarily the oldest if, for example, the parent material is easily weathered. In some soils the dominant influence of some other factor, such as highly resistant parent material or a high water table, may largely determine the features of the soil.

The oldest soils generally are those in which the parent material has been most altered; however, some of the oldest geological formations in the county have

some of the youngest soils. When the slopes are very steep or steep and where geological erosion and soil creep equalize soil formation and weathering of parent material, soil formation and erosion may proceed simultaneously. The result may be downward development of the soil profile as the surface is removed.

Young soils with little or no alteration of parent material or formation of distinct horizons can be separated into three groups in the county. One group consists of soils that formed on recent flood plains, such as Wolfcreek soils. There has been little time for organic matter accumulation or horizon differentiation. Another group consists of soils that formed on somewhat older flood plains, such as Lupoyoma and Still soils. There has been time for accumulation of organic matter and the subsequent darkening of the surface horizon and for some horizon differentiation. Another group of young soils formed on hard rock in steep, mountainous areas where soil material is eroded as rapidly as it weathers from the parent material. Etsel and Yollabolly soils are in this group.

Somewhat older soils have undergone changes other than the addition of organic matter and the loss or gain of bases. Clay formation has resulted from the weathering of minerals in the soil; in addition, clay has been leached from the surface layer and has accumulated in the subsoil. These soils are represented by the Colloyomi, Skyhigh, and Speaker soils, which formed in moderately steep and steep areas on uplands. As clay accumulated in the subsoil, the difference between the surface layer and the subsoil became greater and horizon boundaries became more distinct.

The Wappo, Manzanita, and Kekawaka soils are classified as Palexeralfs and represent some of the oldest soils in the county. Wappo and Manzanita soils are on old, dissected alluvial terraces. Kekawaka soils are in sloping and moderately steep areas on uplands. In Lake County, very deep soils with distinct horizon differentiation and a bright red clay subsoil generally are considered to be very mature soils.

Morphology of the Soils

The formation of soils involves a process consisting of the accumulation of parent material and the differentiation of horizons in the profile (*3, 5, 10*). These steps merge and overlap, and it is difficult to identify the beginning and end of any one process.

Parent material accumulates in place as underlying rock weathers or it is transported from its place of origin as alluvium or colluvium or by other processes. When a soil has 35 percent or more by volume of rock fragments in selected horizons or within arbitrary limits of depth, it is placed in a loamy-skeletal or clayey-skeletal particle-size class. Rock fragments accumulate in the soil profile when they are mixed with soil material in alluvial or colluvial deposits or when the parent material contains hard rock within its matrix that is resistent to weathering.

Horizon differentiation in soils is considered to result from four basic kinds of changes: (1) Addition of mineral and organic materials to the soil, (2) loss of these materials from the soil, (3) translocation of material from one point to another within the soil, and (4) transformation of mineral and organic substances within the soil. These four processes of horizon differentiation are interacting in the formation of most soils, but their relative importance is not uniform for all soils. Not all processes necessarily enhance or start horizon differentiation; some may inhibit it. For example, some clays crack extensively upon drying. Soil material falls into the cracks and subsequently swells upon wetting. This swelling churns the whole soil to the depth of the cracks, thus eliminating the probability of the formation of major horizons in the cracking zone. Clear Lake and Maxwell soils are examples.

Many properties of soils are products of addition, loss, translocation, and transformation of organic matter, bases, soluble salts, carbonates, or silicate clay minerals. Organic matter is added to the surface, transformed into humus, and translocated to another horizon or out of the profile. Bases and carbonates may be translocated through leaching. Gradual removal of bases and carbonates commonly is accompanied by increasing acidity. Bases commonly are absorbed by plants and recycled from lower horizons to the surface. Silicate clays may be formed from primary minerals and accumulate in place or be translocated from the upper to the lower horizons. All of these processes or changes affect horizon formation. The sequence and kinds of horizons are diagnostic for recognition and placement of soils into a system of classification.

The accumulation of organic matter and bases is reflected in a thick, dark-colored surface layer called a mollic epipedon. The presence or absence of only a small amount of organic matter generally results in a light-colored surface layer called an ochric epipedon. An argillic horizon forms by the weathering of primary minerals to silicate clays and subsequent translocation and accumulation of clay in the lower horizon. Further evidence of the argillic horizon is the presence of clay films in pores and on peds.

In Lake County a mollic epipedon is present mainly in soils on alluvial bottom lands, where annual grasses add large amounts of organic matter to the surface. In the hills and mountains of the county, less organic matter is added to the surface and precipitation is higher so that bases are leached, resulting in dominance of an ochric epipedon. Some examples of the processes of horizon differentiation are evidenced in the Cole soils. In these soils organic matter has accumulated to form a thick, dark-colored surface layer, and silicate clays have been translocated to form an argillic horizon. Lupoyoma soils are similar in that they have a mollic epipedon, but they

are younger soils and clay has not accumulated to form an argillic horizon in them. Clear Lake soils have very slow permeability in the subsoil. Carbonates have not been leached but instead have accumulated in these soils; therefore, the substratum is calcareous. Sanhedrin and Kekawaka soils occur in areas of high rainfall and as a result are highly leached and weathered. They are slightly acid to strongly acid and have an ochric epipedon over an argillic horizon. Neuns soils formed in material derived from hard sandstone and shale on steep colluvial slopes. They are in a loamy-skeletal particle-size class and have an ochric epipedon and no argillic horizon.

The addition of organic matter, leaching of bases, and translocation of silicate clays are among the most important processes of horizon differentiation in the soils of Lake County.

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Glossary

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Alluvial cone. The material washed down the sides of mountains and hills by ephemeral streams and deposited at the mouth of gorges in the form of a moderately steep, conical mass descending equally in all directions from the point of issue.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvial plain. A general term for the nearly level to gently sloping bottom surface of an intermontane basin.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Amorphous material. Noncrystaline mineral colloid material. Amorphous material commonly is present in soils that weathered from volcanic ash and some volcanic rock. Soils containing significant amounts of amorphous material commonly have a high pH-dependent cation exchange capacity and a low bulk density.

Animal-unit-month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Area reclaim (in tables). An area difficult to reclaim after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as—

	Inches
Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
Very high	More than 12

Back slope. The geomorphic component that forms the steepest inclined surface and principal element of many hillsides. Back slopes in profile are commonly steep, are linear, and may or may not include cliff segments.

Badland. Steep or very steep, commonly nonstony, barren land dissected by many intermittent drainage channels. Badland is most common in semiarid and arid regions where streams are entrenched in soft geologic material. Local relief generally ranges from 25 to 500 feet. Runoff potential is very high, and geologic erosion is active.

Basal area. The area of a cross section of a tree, generally referring to the section at breast height and measured outside the bark. It is a measure of stand density, commonly expressed in square feet.

Base saturation. The degree to which material having cation exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, K), expressed as a percentage of the total cation exchange capacity.

Basic igneous rock. Rock that formed directly from molten volcanic rock that cooled quickly on or near the surface.

Bottom land. The normal flood plain of a stream, subject to flooding.

Boulders. Rock fragments larger than 2 feet (60 centimeters) in diameter.

Breast height. An average height of 4 1/2 feet above the ground surface; the point on a tree where diameter measurements are ordinarily taken.

Brush management. Use of mechanical, chemical, or biological methods to reduce or eliminate competition of woody vegetation to allow understory grasses and forbs to recover, or to make conditions favorable for reseeding. It increases production of forage, which reduces erosion. Brush management may improve the habitat for some species of wildlife.

Cable yarding. A method of moving felled trees to a nearby central area for transport to a processing facility. Most cable yarding systems involve use of a drum, a pole, and wire cables in an arrangement similar to that of a rod and reel used for fishing. To reduce friction and soil disturbance, felled trees

generally are reeled in while one end is lifted or the entire log is suspended.

Canopy. The leafy crown of trees or shrubs. (See Crown.)

Channery soil. A soil that is, by volume, more than 15 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches along the longest axis. A single piece is called a channer.

Chemical treatment. Control of unwanted vegetation by use of chemicals.

Chiseling. Tillage with an implement having one or more soil-penetrating points that loosen the subsoil and bring clods to the surface. A form of emergency tillage to control soil blowing.

Clay. As a soil separate, the mineral soil particles less than 0.002 millimeter in diameter. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.

Clay film. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.

Claypan. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.

Coarse fragments. Mineral or rock particles larger than 2 millimeters in diameter.

Coarse textured soil. Sand or loamy sand.

Cobble (or cobblestone). A rounded, partly rounded, or angular fragment of rock 3 to 10 inches (7.6 to 25 centimeters) in diameter.

Cobbly soil material. Material that is 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.5 to 25 centimeters) in diameter. Very cobbly soil material is 35 to 60 percent of these rock fragments, and extremely cobbly soil material is more than 60 percent.

Colluvium. Soil material, rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.

Commercial (productive) forest land. Land capable of producing 20 cubic feet per acre per year of industrial wood and is manageable for continuous timber crops. Noncommercial forest land includes all other land that is at least 10 percent stocked by trees or is capable of being stocked by trees.

Confidence limits. Two statistical points between which, with a certain agreed probability, the parameter being estimated is expected to lie.

Conservation cropping system. Growing crops in combination with needed cultural and management practices. If soil improving crops and practices used in the system more than offset the soil depleting crops and deteriorating practices, then it is a good conservation cropping system. Cropping systems are needed on all tilled soils. Soil improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

Consistence, soil. The feel of the soil and the ease with which a lump can be crushed by the fingers. Terms commonly used to describe consistence are—

Loose. —Noncoherent when dry or moist; does not hold together in a mass.

Friable. —When moist, crushes easily under gentle pressure between thumb and forefinger and can be pressed together into a lump.

Firm. —When moist, crushes under moderate pressure between thumb and forefinger, but resistance is distinctly noticeable.

Plastic. —When wet, readily deformed by moderate pressure but can be pressed into a lump; will form a "wire" when rolled between thumb and forefinger.

Sticky. —When wet, adheres to other material and tends to stretch somewhat and pull apart rather than to pull free from other material.

Smeary. —When wet, under pressure between the thumb and forefinger, the soil material suddenly changes to fluid; the fingers "skid" and the soil smears and is slippery. After soil smears there is evidence of free water on fingers.

Hard. —When dry, moderately resistant to pressure; can be broken with difficulty between thumb and forefinger.

Soft rock. —When dry, breaks into powder or individual grains under very slight pressure.

Cemented. —Hard; little affected by moistening.

Control section. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.

Cover crop. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.

Crop residue management. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.

Cropping system. Growing crops using a planned system of rotation and management practices.

Cross-slope farming. Deliberately conducting farming operations on sloping farmland in such a way that village is across the general slope.

Crown. The upper part of a tree or shrub, including the living branches and their foliage.

Culmination of the mean annual increment (CMAI). The average annual increase per acre in the volume

of a stand. Computed by dividing the total volume of the stand by its age. As the stand increases in age, the mean annual increment continues to increase until mortality begins to reduce the rate of increase. The point where the stand reaches its maximum annual rate of growth is called the culmination of the mean annual increment.

Cutbanks cave (in tables). The walls of excavations tend to cave in or slough.

Depth to rock (in tables). Bedrock is too near the surface for the specified use.

Divided-slope farming. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce water erosion. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.

Drainage class (natural). Refers to the frequency and duration of periods of saturation or partial saturation during soil formation, as opposed to altered drainage, which is commonly the result of artificial drainage or irrigation but may be caused by the sudden deepening of channels or the blocking of drainage outlets. Seven classes of natural soil drainage are recognized:

Excessively drained. —Water is removed from the soil very rapidly. Excessively drained soils are commonly very coarse textured, rocky, or shallow. Some are steep. All are free of the mottling related to wetness.

Somewhat excessively drained. —Water is removed from the soil rapidly. Many somewhat excessively drained soils are sandy and rapidly pervious. Some are shallow. Some are so steep that much of the water they receive is lost as runoff. All are free of the mottling related to wetness.

Well drained.—Water is removed from the soil readily, but not rapidly. It is available to plants throughout most of the growing season, and wetness does not inhibit growth of roots for significant periods during most growing seasons. Well drained soils are commonly medium textured. They are mainly free of mottling.

Moderately well drained. —Water is removed from the soil somewhat slowly during some periods. Moderately well drained soils are wet for only a short time during the growing season, but periodically they are wet long enough that most mesophytic crops are affected. They commonly have a slowly pervious layer within or directly below the solum, or periodically receive high rainfall, or both.

Somewhat poorly drained. —Water is removed slowly enough that the soil is wet for significant periods during the growing season. Wetness markedly restricts the growth of mesophytic crops unless artificial drainage is provided. Somewhat poorly drained soils commonly have a slowly pervious layer, a high water table, additional water from seepage, nearly continuous rainfall, or a combination of these.

Poorly drained. —Water is removed so slowly that the soil is saturated periodically during the growing season or remains wet for long periods. Free water is commonly at or near the surface for long enough during the growing season that most mesophytic crops cannot be grown unless the soil is artificially drained. The soil is not continuously saturated in layers directly below plow depth. Poor drainage results from a high water table, a slowly pervious layer within the profile, seepage, nearly continuous rainfall, or a combination of these.

Very poorly drained. —Water is removed from the soil so slowly that free water remains at or on the surface during most of the growing season. Unless the soil is artificially drained, most mesophytic crops cannot be grown. very poorly drained soils are commonly level or depressed and are frequently ponded. Yet, where rainfall is high and nearly continuous, they can have moderate or high slope gradients.

Drainage, surface. Runoff, or surface flow of water, from an area.

Eolian soil material. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.

Erosion. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.

Erosion hazard. The potential inherent in the soil itself to erode if the forces that cause accelerated erosion (water, for the purpose of this report) are applied to an area that is not adequately protected. Erosion hazard ratings in this report are based on predicted annual soil loss under bare soil conditions (no plant cover) and were determined using the Universal Soil Loss Equation, where A equals tons per acre per year; R, 50; K, actual value for the surface layer; L, 10 feet; S, actual percent slope of the map unit; C, 1.0; and P, 10. Three erosion hazard classes are recognized. They are slight, less than 5 tons per acre; moderate, 5 to 20 tons per acre; and severe, 20 to 50 tons or more per acre; the C values were adjusted and soil loss tolerances were considered to more accurately the predict erosion hazard after use of specific timber harvesting practices.

Escarpment. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and produced by erosion or faulting.

Excess alkali (in tables). Excess exchangeable sodium in the soil. The resulting poor physical properties restrict the growth of plants.

Excess fines (in tables). Excess silt and clay in the soil. The soil does not provide a source of gravel or sand for construction purposes.

Excess lime (in tables). Excess carbonates in the soil that restrict the growth of some plants.

Excess salts (in tables). Excess water-soluble salts in the soil that restrict the growth of most plants.

Extrusive rock. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.

Fallow. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.

Fan terrace. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.

Fast intake (in tables). The rapid movement of water into the soil.

Fertility, soil. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.

Fill slope. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.

Fine textured soil. Sandy clay, silty clay, and clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of men and equipment in fire fighting. Designated roads also serve as firebreaks.

Flood plain. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.

Foothill. A steeply sloping upland that has relief of as much as 1,000 feet (or 300 meters) and fringes a mountain range or high-plateau escarpment.

Foot slope. The inclined surface at the base of a hill.

Forest cover. All trees and other woody plants (underbrush) covering the ground in a forest.

Forest type. A stand of trees similar in composition and development because of given physical and biological factors by which it may be differentiated from other stands.

Fragile (in tables). A soil that is easily damaged by use or disturbance.

Fragipan. A loamy, brittle subsurface horizon low in porosity and content of organic matter and low or moderate in clay but high in silt or very fine sand. A fragipan appears cemented and restricts roots. When dry, it is hard or very hard and has a higher bulk density than the horizon or horizons above. When moist, it tends to rupture suddenly under pressure rather than to deform slowly.

Frost action (in tables). Freezing and thawing of soil moisture. Frost action can damage roads, buildings and other structures, and plant roots.

Grassed waterway. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.

Gravel. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) in diameter. An individual piece is a pebble.

Gravelly soil material. Material that is 15 to 50 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) in diameter.

Ground water (geology). Water filling all the unblocked pores of underlying material below the water table.

Gully. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.

Hard rock. Rock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.

Hardpan. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.

High-residue crops. Crops such as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil.

Hill. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well-defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.

Horizon, soil. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an upper case letter represents the major horizons. Numbers or lower case letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the *Soil Survey Manual*. The major horizons of mineral soil are as follows:

O horizon. —An organic layer of fresh and decaying plant residue at the surface of a mineral soil.

A horizon. —The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
B horizon. —The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these. The combined A and B horizons generally are called the solum, or true soil. If a soil does not have a B horizon, the A horizon alone is the solum.
C horizon. —The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the A or B horizon. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, the Roman numeral II precedes the letter C.
Cr layer. —A layer of weathered or soft rock that roots cannot enter except along fractures, and that is soft enough to be dug with a spade.
R layer. —Consolidated rock beneath the soil. The rock commonly underlies a C horizon, but can be directly below an A or a B horizon.

Igneous rock. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.

Intake rate. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake in inches per hour is expressed as follows:

Less than 0.2	very low
0.2 to 0.4	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

Intermittent stream. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.

Irrigation. Application of water to soils to assist in production of crops. Methods of irrigation are—
Border. —Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
Basin. —Water is applied rapidly to nearly level plains surrounded by levees or dikes.
Controlled flooding. —Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
Corrugation. —Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
Drip (or trickle). —Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
Furrow. —Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
Sprinkler. —Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
Subirrigation. —Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
Wild flooding. —Water, released at high points, is allowed to flow onto an area without controlled distribution.

Knoll. A small, low, rounded hill rising above adjacent landforms.

Lacustrine deposit (geology). Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.5 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Light textured soil. Sand and loamy sand.

Lithic contact. The boundary between soil material and the underlying hard rock (R layer).

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind.

Low-residue crops. Crops such as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Mean annual increment. The total volume up to a given age divided by that age. The culmination of mean annual increment (CMAI) is the maximum value

obtainable for the mean annual increment. The age at which this occurs varies by species, site index, and units of measurement.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Metasedimentary rock. Sedimentary rock that has undergone varying degrees of metamorphic processes.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, and fine sandy loam.

Moderately fine textured soil. Clay loam, sandy clay loam, and silty clay loam.

Mottling, soil. Irregular spots of different colors that vary in number and size. Mottling generally indicates poor aeration and impeded drainage. Descriptive terms are as follows: abundance—*few, common,* and *many*; size—*fine, medium,* and *coarse*; and contrast—*faint, distinct,* and *prominent*. The size measurements are of the diameter along the greatest dimension. *Fine* indicates less than 5 millimeters (about 0.2 inch); *medium*, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and *coarse*, more than 15 millimeters (about 0.6 inch).

Mountain. A natural elevation of the land surface, rising more than 1,000 feet above surrounding lowlands, commonly of restricted summit area (relative to a plateau) and generally having steep sides and considerable bare-rock surface. A mountain can occur as a single, isolated mass or in a group forming a chain or range.

Mudstone. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.

Munsell notation. A designation of color by degrees of the three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color of 10YR hue, value of 6, and chroma of 4.

Neutral soil. A soil having a pH value between 6.6 and 7.3. (See Reaction, soil.)

Organic matter. Plant and animal residue in the soil in various stages of decomposition.

Pan. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, *hardpan, fragipan, claypan, plowpan,* and *traffic pan.*

Paralithic contact. The boundary between the soil and the underlying soft, weathered rock (Cr layer).

Parent material. The unconsolidated organic and mineral material in which soil forms.

Pebble. See gravel.

Ped. An individual natural soil aggregate, such as a granule, a prism, or a block.

Pedon. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to premit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.

Percs slowly (in tables). The slow movement of water through the soil adversely affecting the specified use.

Permeability. The quality of the soil that enables water to move downward through the profile. Permeability is measured as the number of inches per hour that water moves downward through the saturated soil. Terms describing permeability are:

Very slow	less than 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Very rapid	more than 20 inches

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)

Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting ground ice. They form on the soil after plant cover is removed.

Plateau. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. The water can be removed only by percolation or evapotranspiration.

Poor filter (in tables). Because of rapid permeability or an impermeable layer near the surface, the soil may not adequately filter effluent from a waste disposal system.

Poor outlets (in tables). Refers to areas where surface or subsurface drainage outlets are difficult or expensive to install.

Potential plant community. The plant community on a given site that will be established if present environmental conditions continue to prevail and the

site is properly managed. (See climax plant community.)

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Controlled application of fire to wild-land fuels in either their natural or modified state, under such conditions of weather, fuel moisture, and soil moisture as allow the fire to be confined to a predetermined area and at the same time to produce the intensity of heat and rate of spread required to further certain planned objectives of silviculture, wildlife management, grazing, and fire-hazard reduction. It seeks to employ fire scientifically so as to realize maximum net benefits with minimum damage and at acceptable cost.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This increases the vigor and reproduction of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Range condition. The present composition of the plant community on a range site in relation to the potential natural plant community for that site. Range condition is expressed as excellent, good, fair, or poor on the basis of how much the present plant community has departed from the potential.

Range site. An area of rangeland where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. A range site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other range sites in kind or proportion of species or total production.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degree of acidity or alkalinity is expressed as—

	pH
Extremely acid	Below 4.5
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Medium acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Mildly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

Relief. The elevations or inequalities of a land surface, considered collectively.

Residuum (residual soil material). Unconsolidated, weathered, or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.

Road cut. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.

Rock fragments. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.

Rooting depth (in tables). Shallow root zone. The soil is shallow over a layer that greatly restricts roots.

Runoff. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from ground water.

Sand. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters in diameter. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.

Sandstone. Sedimentary rock containing dominantly sand-size particles.

Saprolite (soil science). Unconsolidated residual material underlying the soil and grading to hard bedrock below.

Sedimentary rock. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Seepage (in tables). The movement of water through the soil. Seepage adversely affects the specified use.

Series, soil. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer or of the underlying material. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Silt. As a soil separate, individual mineral particles that range in diameter from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Site class. A grouping of site indexes into 5 to 7 production capability levels. Each level can be represented by a site curve.

Site curve (50-year). A set of related curves on a graph that shows the average height of dominant trees for the range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant trees that are 50 years old or are 50 years old at breast height.

Site curve (100-year). A set of related curves on a graph that show the average height of dominant and codominant trees for a range of ages on soils that differ in productivity. Each level is represented by a curve. The basis of the curves is the height of dominant and codominant trees that are 100 years old or are 100 years old at breast height.

Site index. A designation of the quality of a forest site based on the height of the dominant stand at an arbitrarily chosen age. For example, if the average height attained by dominant and codominant trees in a fully stocked stand at the age of 50 years is 75 feet, the site index is 75 feet.

Skidding. A broad term for hauling loads by sliding. The timber may slide more or less wholly along the ground (ground skidding) or with its forward end supported (high-lead skidding), or even wholly off the ground—sliding along a cable—during its main transit (aerial skidding).

Skid road. Any way, more or less prepared, over which logs are dragged.

Slippage (in tables). Soil mass susceptible to movement downslope when loaded, excavated, or wet.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey the following slope classes are recognized:

	Percent
Nearly level	0 to 2
Gently sloping	2 to 5
Moderately sloping	5 to 9
Strongly sloping	9 to 15
Moderately steep	15 to 30
Steep	30 to 50
Very steep	50 and higher

Slope (in tables). Slope is great enough that special practices are required to ensure satisfactory performance of the soil for a specific use.

Slow intake (in tables). The slow movement of water into the soil.

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Small stones (in tables). Rock fragments less than 3 inches (7.5 centimeters) in diameter. Small stones adversely affect the specified use of the soil.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na^{+} to $Ca^{++} + Mg^{++}$. The degrees of sodicity are—

	SAR
Slight	Less than 13:1
Moderate	13-30:1
Strong	More than 30:1

Soft rock. Rock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.

Soil. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.

Soil separates. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes of separates recognized in the United States are as follows:

	Millimeters
Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

Solum. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the underlying material. The living roots and plant and animal activities are largely confined to the solum.

Stones. Rock fragments 10 to 24 inches (25 to 60 centimeters) in diameter if rounded or 6 to 15 inches (15 to 38 centimeters) in length if flat.

Stony. Refers to a soil containing stones in numbers that interfere with or prevent tillage.

Stratified. Occurring in strata or layers. The term refers to geologic material, such as alluvially deposited strata. Layers in soils that result from the processes of soil formation are called horizons; those inherited from the parent material are called strata.

Stripcropping. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind and water erosion.

Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—*platy* (laminated), *prismatic* (vertical axis of aggregates longer than horizontal), *columnar* (prisms with rounded tops), *blocky* (angular or subangular), and *granular*. *Structureless* soils are either *single grained* (each grain by itself, as in dune sand) or *massive* (the particles adhering without any regular cleavage, as in many hardpans).

Stubble mulch. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.

Subsoil. Technically, the B horizon; roughly, the part of the solum below plow depth.

Subsoiling. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.

Substratum. The part of the soil below the solum.

Subsurface layer. Technically, the A2 horizon. Generally refers to a leached horizon lighter in color and lower in content of organic matter than the overlying surface layer.

Summer fallow. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.

Surface layer. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."

Surface runoff. Water that flows away from the soil over the surface without infiltrating. The water may come from precipitation or runoff from adjacent areas. The rate and amount of surface runoff can be significantly different under varying conditions. Surface runoff is influenced by such things as the kind and amount of natural soil cover, the infiltration rate, and permeability of the soil, the rainfall intensity, and the topography. Surface runoff is predicted based on bare soil conditions (no natural soil cover) in this report. Six classes of rate of runoff are recognized:

Ponded. —Little of the precipitation and run-on escapes as runoff, and free water stands on the surface for significant periods. The amount of water that must be removed from ponded areas by movement through the soil, by plants, or by evaporation is usually greater than the total rainfall. Ponding normallly occurs on level to nearly level depressional soils, and water depth may fluctuate greatly.

Very slow. —Surface water flows away slowly, and free water stands on the surface for long periods or immediately enters the soil. Most of the water passes through the soil, is used by plants, or evaporates. The soils commonly have slopes of 0 to 2 percent, or they are steeper but absorb precipitation very rapidly.

Slow. —Surface water flows away slowly enough that free water stands on the surface for moderate periods or enters the soil rapidly. Most of the water passes through the soil, is used by plants, or evaporates. The soils commonly have slopes of 2 to 5 percent, or they are steeper but absorb precipitation very rapidly.

Medium. —Surface water flows away fast enough that free water stands on the surface for only short periods. Part of the precipitation enters the soil and is used by plants, is lost by evaporation, or moves into underground channels. The soils commonly have slopes of 5 to 15 percent and absorb water at a moderate rate, or they are steeper but absorb water rapidly.

Rapid. —Surface water flows away fast enough that the period of concentration is brief and free water does not stand on the surface. Only a small part of the water enters the soil. The soils commonly have slopes of 15 to 50 percent and have moderate to slow rates of absorption.

Very rapid. —Surface water flows away so fast that the period of concentration is very brief and free water does not stand on the surface. Only a small part of the water enters the soil. The soils commonly have slopes of 30 to 50 percent or more and absorb precipitation slowly.

Tail water. The water just downstream of a structure.

Terrace. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.

Texture, soil. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are *sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay,* and *clay*. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."

Thin layer (in tables). Otherwise suitable soil material too thin for the specified use.

Till plain. An extensive flat to undulating area underlain by glacial till.

Tilth, soil. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.

Toe slope. The outermost inclined surface at the base of a hill; part of a foot slope.

Too arid (in tables). The soil is dry most of the time, and vegetation is difficult to establish.

Toxicity (in tables). Excessive amount of toxic substances, such as sodium or sulfur, that severely hinder establishment of vegetation or severely restrict plant growth.

Tuff. A compacted deposit that is 50 percent or more volcanic ash and dust.

Type conversion. The land management practice of converting the type of vegetation that is growing in an area to a different vegetation type. A common practice is to burn an area dominated by brushlike plants and reseed with grasses.

Unstable fill (in tables). Risk of caving or sloughing on banks of fill material.

Upland (geology). Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.

Valley border surface. A general grouping of valley side geomorphic surfaces that occurs in a stepped sequence graded to successively lower stream base levels produced by episodic valley entrenchment.

Valley fill. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Valley side alluvium. A concave "slopewash" deposit at the base of a hillslope, mountain slope, terrace escarpment, or other such position.

Variant, soil. A soil having properties sufficiently different from those of other known soils to justify a new series name, but occurring in such a limited geographic area that creation of a new series is not justified.

Water bars. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.

Water table. The highest part of the soil or underlying rock material that is wholly saturated with water. In some places a perched water table may be separated from a lower one by a dry zone.

Weathering. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.

Windthrow. The action of uprooting and tipping over trees by the wind.

Tables

TABLE 1.--TEMPERATURE AND PRECIPITATION

[Recorded in the period 1948-73 at Lakeport, CA]

Month	Temperature			Precipitation
	Maximum	Minimum	Mean	
	°F	°F	°F	In
January----	52	32	42	7.15
February---	58	34	46	4.15
March------	61	35	48	3.25
April------	69	38	54	2.00
May--------	77	43	60	0.65
June-------	86	49	68	0.32
July-------	95	52	74	0.02
August-----	93	51	72	0.16
September--	88	48	68	0.28
October----	75	42	58	1.77
November---	61	37	49	4.44
December---	53	33	43	6.06
Yearly:				
Average--	72	41	57	---
Total----	---	---	---	30.29

TABLE 2.--PROBABILITY OF RECEIVING FREEZING TEMPERATURES AFTER GIVEN DATES IN SPRING AND BEFORE GIVEN DATES IN FALL

[Recorded in the period 1948-73 at Lakeport, CA]

Season	T*	Percentage								
		10	20	30	40	50	60	70	80	90
	°F									
Spring-----	32	5/14	5/11	5/6	4/28	4/27	4/23	4/22	4/13	4/10
	28	4/27	4/24	4/8	3/25	3/20	3/17	3/13	3/9	3/2
Fall-------	32	10/14	10/17	10/25	10/28	11/3	11/6	11/13	11/14	11/17
	28	10/30	11/10	11/15	11/17	11/18	11/19	11/24	11/27	12/6

* Temperature at which killing frost occurs.

TABLE 3.--PROBABILITY OF RECEIVING LESS THAN THE INDICATED ANNUAL PRECIPITATION

[Recorded in the period 1948-73 at Lakeport and Middletown, CA]

Location	Probability (percentage)								
	10	20	30	40	50	60	70	80	90
	In	In	In	In	In	In	In	In	In
Lakeport----	22.4	24.6	27.0	28.5	30.9	32.1	33.3	35.7	38.0
Middletown--	32.3	38.4	46.6	48.7	50.0	50.4	51.4	59.2	66.3

TABLE 4.--DURATION AND FREQUENCY OF OCCURRENCE OF STORMS

[Recorded in the period 1931-60 at Lakeport, CA]

Duration	Number of storms in given number of years					
	2	5	10	25	50	100
1 hour-----	0.4	0.5	0.6	0.7	0.8	1.0
3 hours----	0.9	1.0	1.1	1.3	1.4	1.6
6 hours----	1.5	1.7	2.1	2.4	2.7	2.9
12 hours----	1.8	2.3	2.7	3.0	3.3	3.6
24 hours----	2.5	3.1	3.6	4.1	4.5	4.9
1 month----	8.8	11.3	13.2	15.9	17.8	19.5

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS

Map symbol	Soil name	Acres	Percent
101	Aiken-Sobrante association, 5 to 15 percent slopes	1,165	0.1
102	Aiken-Sobrante association, 15 to 30 percent slopes	635	0.1
103	Asbill clay loam, 5 to 8 percent slopes	1,030	0.1
104	Asbill clay loam, 8 to 15 percent slopes	1,080	0.1
105	Badland	120	*
106	Bally-Phipps gravelly loams, 2 to 8 percent slopes	475	0.1
107	Bally-Phipps complex, 15 to 30 percent slopes	3,460	0.4
108	Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes	17,380	2.0
109	Bamtush-Neuns gravelly loams, 15 to 30 percent slopes	1,400	0.2
110	Bamtush-Speaker-Sanhedrin gravelly loams, 30 to 50 percent slopes	5,750	0.7
111	Bamtush-Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes	2,260	0.3
112	Benridge-Konocti association, 15 to 30 percent slopes	4,715	0.6
113	Benridge-Konocti association, 30 to 50 percent slopes	10,010	1.2
114	Benridge-Sodabay loams, 8 to 15 percent slopes	620	0.1
115	Benridge-Sodabay loams, 15 to 30 percent slopes	540	0.1
116	Benridge Variant loam, 2 to 15 percent slopes	1,780	0.2
117	Bottlerock-Glenview-Arrowhead complex, 5 to 30 percent slopes	4,645	0.5
118	Bottlerock-Glenview-Arrowhead complex, 30 to 50 percent slopes	710	0.1
119	Bressa-Millsholm loams, 8 to 15 percent slopes	1,055	0.1
120	Bressa-Millsholm loams, 15 to 30 percent slopes	7,600	0.9
121	Clear Lake clay, drained, cool	1,155	0.1
122	Clear Lake Variant clay, drained	1,940	0.2
123	Cole clay loam, drained	4,375	0.5
124	Cole Variant clay loam	1,550	0.2
125	Cole Variant clay loam, calcareous substratum	660	0.1
126	Collayomi complex, 50 to 75 percent slopes	2,010	0.2
127	Collayomi-Aiken-Whispering complex, 5 to 30 percent slopes	8,750	1.0
128	Collayomi-Aiken-Whispering complex, 30 to 50 percent slopes	5,600	0.7
129	Collayomi-Whispering complex, 30 to 50 percent slopes	2,165	0.3
130	Deadwood-Sheetiron association, 50 to 75 percent slopes	4,625	0.5
131	Fluvaquentic Haplaquolls, nearly level	1,600	0.2
132	Forbesville loam, 2 to 5 percent slopes	700	0.1
133	Forbesville loam, 5 to 15 percent slopes	1,820	0.2
134	Forward Variant-Kidd association, 30 to 50 percent slopes	1,795	0.2
135	Forward Variant-Kidd association, 50 to 75 percent slopes	400	*
136	Freezeout-Yollabolly very gravelly sandy loams, 30 to 50 percent slopes	4,720	0.6
137	Freezeout-Yollabolly very gravelly sandy loams, 50 to 75 percent slopes	4,320	0.5
138	Glenview-Arrowhead complex, 5 to 15 percent slopes	2,045	0.2
139	Glenview-Arrowhead complex, 15 to 30 percent slopes	975	0.1
140	Glenview-Bottlerock complex, 2 to 5 percent slopes	400	*
141	Henneke-Montara complex, 8 to 15 percent slopes	1,080	0.1
142	Henneke-Montara-Rock outcrop complex, 15 to 50 percent slopes	28,230	3.3
143	Henneke-Okiota complex, 30 to 50 percent slopes	13,270	1.5
144	Jafa loam, 2 to 5 percent slopes	1,155	0.1
145	Jafa loam, 5 to 15 percent slopes	730	0.1
146	Jafa complex, 5 to 30 percent slopes	3,300	0.4
147	Kelsey fine sandy loam	2,755	0.3
148	Kidd-Forward complex, 5 to 30 percent slopes	2,190	0.3
149	Kidd-Forward complex, 30 to 50 percent slopes	1,000	0.1
150	Kilaga Variant loam, 0 to 5 percent slopes	1,870	0.2
151	Konocti-Benridge complex, 50 to 75 percent slopes	3,140	0.4
152	Konocti-Hambright complex, 5 to 15 percent slopes	1,550	0.2
153	Konocti-Hambright complex, 15 to 30 percent slopes	3,615	0.4
154	Konocti-Hambright-Rock outcrop complex, 30 to 75 percent slopes	1,055	0.1
155	Konocti Variant-Konocti-Hambright complex, 2 to 15 percent slopes	1,845	0.2
156	Konocti Variant-Konocti-Hambright complex, 15 to 30 percent slopes	1,700	0.2
157	Landlow Variant silty clay loam	600	0.1
158	Lupoyoma silt loam, protected	4,820	0.6
159	Manzanita loam, 2 to 5 percent slopes	1,180	0.1
160	Manzanita loam, 5 to 15 percent slopes	1,275	0.1
161	Manzanita loam, 15 to 25 percent slopes	1,180	0.1
162	Manzanita gravelly loam, 2 to 8 percent slopes	900	0.1
163	Manzanita gravelly loam, 8 to 25 percent slopes	1,375	0.2

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
164	Maxwell clay loam, 0 to 2 percent slopes	2,550	0.3
165	Maxwell clay loam, 2 to 8 percent slopes	1,265	0.1
166	Maymen-Etsel-Mayacama complex, 15 to 30 percent slopes	1,000	0.1
167	Maymen-Etsel-Mayacama complex, 30 to 75 percent slopes	57,996	6.8
168	Maymen-Etsel-Snook complex, 15 to 30 percent slopes	4,180	0.5
169	Maymen-Etsel-Snook complex, 30 to 75 percent slopes	77,110	9.0
170	Maymen-Etsel-Speaker association, 30 to 50 percent slopes	21,200	2.5
171	Maymen-Hopland-Etsel association, 15 to 50 percent slopes	21,190	2.5
172	Maymen-Hopland-Mayacama complex, 9 to 30 percent slopes	1,825	0.2
173	Maymen-Hopland-Mayacama association, 30 to 50 percent slopes	20,500	2.4
174	Maymen-Hopland-Mayacama association, 50 to 75 percent slopes	12,050	1.4
175	Maymen-Millsholm-Bressa complex, 30 to 50 percent slopes	13,150	1.5
176	Maywood Variant sandy loam	750	0.1
177	Millsholm-Bressa loams, 30 to 50 percent slopes	17,400	2.0
178	Millsholm-Bressa-Hopland association, 30 to 50 percent slopes	9,500	1.1
179	Millsholm-Squawrock-Pomo complex, 30 to 50 percent slopes	1,420	0.2
180	Mocho Variant loam	1,670	0.2
181	Neice-Sobrante-Hambright complex, 15 to 30 percent slopes	1,920	0.2
182	Neice-Sobrante-Hambright complex, 30 to 75 percent slopes	2,360	0.3
183	Neuns-Bamtush-Deadwood association, 30 to 50 percent slopes	13,050	1.5
184	Neuns-Deadwood-Bamtush association, 50 to 75 percent slopes	4,450	0.5
185	Neuns-Decy-Sanhedrin complex, 30 to 50 percent slopes	4,645	0.5
186	Neuns-Sanhedrin-Deadwood complex, 30 to 50 percent slopes	17,250	2.0
187	Neuns-Sanhedrin-Deadwood complex, 50 to 75 percent slopes	17,180	2.0
188	Neuns-Sanhedrin-Speaker gravelly loams, 30 to 50 percent slopes	14,200	1.7
189	Neuns-Sheetiron-Deadwood complex, 30 to 50 percent slopes	6,200	0.7
190	Neuns-Sheetiron-Deadwood complex, 50 to 75 percent slopes	4,470	0.5
191	Neuns-Speaker gravelly loams, 15 to 30 percent slopes	1,550	0.2
192	Okiota-Henneke complex, 5 to 30 percent slopes	5,525	0.6
193	Okiota-Henneke-Dubakella association, 15 to 50 percent slopes	11,900	1.4
194	Oxalis Variant silt loam	675	0.1
195	Phipps complex, 5 to 15 percent slopes	2,020	0.2
196	Phipps complex, 15 to 30 percent slopes	1,745	0.2
197	Phipps complex, 30 to 50 percent slopes	9,070	1.1
198	Pomo-Bressa loams, 15 to 50 percent slopes	1,030	0.1
199	Riverwash	1,220	0.1
200	Rock outcrop-Etsel-Snook complex, 50 to 80 percent slopes	3,300	0.4
201	Sanhedrin-Kekawaka-Speaker complex, 15 to 30 percent slopes	2,900	0.3
202	Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes	29,205	3.4
203	San Joaquin Variant fine sandy loam, 0 to 5 percent slopes	475	0.1
204	Sheetiron-Deadwood association, 30 to 50 percent slopes	11,050	1.3
205	Sheetiron-Deadwood association, 50 to 75 percent slopes	21,200	2.5
206	Shortyork Variant-Yorkville-Squawrock association, 15 to 50 percent slopes	3,750	0.4
207	Skyhigh-Asbill complex, 8 to 15 percent slopes	450	0.1
208	Skyhigh-Asbill complex, 15 to 50 percent slopes	5,700	0.7
209	Skyhigh-Millsholm loams, 15 to 50 percent slopes	25,090	2.9
210	Skyhigh-Sleeper-Millsholm association, 8 to 15 percent slopes	650	0.1
211	Skyhigh-Sleeper-Millsholm association, 15 to 30 percent slopes	1,525	0.2
212	Skyhigh-Sleeper-Millsholm association, 30 to 50 percent slopes	3,880	0.5
213	Sleeper Variant-Sleeper loams, 5 to 15 percent slopes	525	0.1
214	Sleeper Variant-Sleeper loams, 15 to 30 percent slopes	1,690	0.2
215	Sleeper Variant-Sleeper loams, 30 to 50 percent slopes	1,645	0.2
216	Sobrante-Collayomi-Whispering association, 15 to 30 percent slopes	655	0.1
217	Sobrante-Collayomi-Whispering association, 30 to 50 percent slopes	1,350	0.2
218	Sobrante-Guenoc-Hambright complex, 2 to 15 percent slopes	1,575	0.2
219	Sobrante-Guenoc-Hambright complex, 15 to 30 percent slopes	6,680	0.8
220	Sobrante-Hambright-Guenoc complex, 30 to 50 percent slopes	3,000	0.4
221	Sodabay loam, 5 to 15 percent slopes	615	0.1
222	Sodabay loam, 15 to 30 percent slopes	665	0.1
223	Sodabay-Konocti association, 5 to 30 percent slopes	4,670	0.5
224	Speaker-Marpa-Sanhedrin gravelly loams, 30 to 50 percent slopes	8,650	1.0
225	Speaker-Maymen-Marpa association, 30 to 50 percent slopes	15,150	1.8
226	Speaker-Maymen-Marpa association, 50 to 75 percent slopes	7,255	0.8

See footnote at end of table.

TABLE 5.--ACREAGE AND PROPORTIONATE EXTENT OF THE SOILS--Continued

Map symbol	Soil name	Acres	Percent
227	Speaker-Maymen-Millsholm association, 30 to 50 percent slopes	1,770	0.2
228	Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes	1,525	0.2
229	Speaker-Sanhedrin-Maymen association, 30 to 50 percent slopes	8,900	1.0
230	Speaker-Speaker Variant-Sanhedrin association, 5 to 30 percent slopes	2,260	0.3
231	Squawrock-Shortyork Variant gravelly loams, 15 to 30 percent slopes	835	0.1
232	Still loam	1,310	0.2
233	Still loam, stratified substratum	4,770	0.6
234	Still gravelly loam	1,770	0.2
235	Still-Talmage complex, 2 to 8 percent slopes	1,375	0.2
236	Stonyford-Guenoc complex, 30 to 50 percent slopes	700	0.1
237	Talmage very gravelly sandy loam	2,755	0.3
238	Tulelake silty clay loam, flooded	1,120	0.1
239	Tulelake silty clay loam, protected	2,610	0.3
240	Tyson-Neuns gravelly loams, 30 to 75 percent slopes	1,230	0.1
241	Vitrandepts-Cinder land complex, 15 to 75 percent slopes	450	0.1
242	Wappo loam, 2 to 8 percent slopes	2,725	0.3
243	Wappo loam, 8 to 15 percent slopes	1,230	0.1
244	Wappo Variant clay loam, 2 to 8 percent slopes	800	0.1
245	Whispering-Collayomi complex, 50 to 75 percent slopes	1,325	0.2
246	Wolfcreek gravelly loam	600	0.1
247	Wolfcreek loam	2,120	0.2
248	Xerofluvents, very gravelly	625	0.1
249	Xerofluvents-Riverwash complex	3,400	0.4
250	Yollabolly-Freezeout very gravelly sandy loams, 30 to 50 percent slopes	1,370	0.2
251	Yollabolly-Rock outcrop-Freezeout complex, 50 to 75 percent slopes	4,400	0.5
252	Yorktree-Hopland-Squawrock complex, 15 to 50 percent slopes	2,480	0.3
253	Yorkville-Pomo complex, 15 to 50 percent slopes	600	0.1
254	Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes	4,880	0.6
255	Yorkville Variant clay loam, 2 to 8 percent slopes	675	0.1
	Water	50,096	5.8
	Total	857,072	100.0

* Less than 0.1 percent.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE

[Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil. Only the soils suited to crops and pasture are listed, except for those that are in map units that include such soils]

Soil name and map symbol	Pears	Walnuts	Grapes, wine	Pasture	Hay crops, annuals
	Tons	Tons	Tons	AUM*	Tons
101**: Aiken---------- Sobrante.	---	***	---	---	---
102**: Aiken---------- Sobrante.	---	***	---	---	---
103, 104---------- Asbill	---	---	3.0	---	3.0
115---------- Benridge-Sodabay	---	0.6	---	---	---
121---------- Clear Lake	11	0.7	4.0	11	3.0
122---------- Clear Lake Variant	13	1.0	4.5	11	4.0
123---------- Cole	15	1.5	5.0	13	4.0
124---------- Cole Variant	15	1.5	5.0	13	4.0
125---------- Cole Variant	11	1.0	4.0	11	4.0
127---------- Collayomi-Aiken-Whispering	---	***	---	---	---
132---------- Forbesville	---	1.0	4.5	11	3.0
133---------- Forbesville	---	1.0	4.5	11	3.0
138, 139---------- Glenview-Arrowhead	---	***	---	---	---
140---------- Glenview-Bottlerock	---	***	---	---	---
147---------- Kelsey	17	1.5	6.0	13	4.0
150---------- Kilaga Variant	---	---	---	13	4.0
157---------- Landlow Variant	---	---	---	11	3.0
158---------- Lupoyoma	17	1.5	6.0	15	4.0

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Pears	Walnuts	Grapes, wine	Pasture	Hay crops, annuals
	Tons	Tons	Tons	AUM*	Tons
159---------- Manzanita	---	1.0	4.5	13	3.0
160---------- Manzanita	---	0.7	4.5	13	3.0
163---------- Manzanita	---	0.7	3.5	---	---
164, 165---------- Maxwell	---	---	---	9	0.7
176---------- Maywood Variant	15	1.5	5.0	13	3
180---------- Mocho Variant	15	1.3	6.0	15	4.0
203---------- San Joaquin Variant	---	---	---	9	2.0
221---------- Sodabay	---	0.8	---	---	---
223**: Sodabay---------- Konocti cobbly loam. Konocti sandy loam.	---	0.5	---	---	---
232---------- Still	17	1.5	6.0	15	4.0
233---------- Still	15	1.3	6.0	15	4.0
234---------- Still	15	1.3	5.0	13	3.0
235---------- Still-Talmage	10	1.0	6.0	10	2.5
237---------- Talmage	9	0.5	3.0	7	1.5
238---------- Tulelake	---	---	---	***	2.0
239---------- Tulelake	---	---	---	11	3.0
242---------- Wappo	---	---	4.5	11	3.0
243---------- Wappo	---	---	4.5	11	3.0
244---------- Wappo Variant	---	---	---	11	3.0
246---------- Wolfcreek	---	---	---	15	4.0

See footnotes at end of table.

TABLE 6.--YIELDS PER ACRE OF CROPS AND PASTURE--Continued

Soil name and map symbol	Pears	Walnuts	Grapes, wine	Pasture	Hay crops, annuals
	Tons	Tons	Tons	AUM*	Tons
247---------- Wolfcreek	---	---	---	13	3.0
255---------- Yorkville Variant	---	---	---	9	1.5

* Animal-unit-month: The amount of forage or feed required to feed one animal unit (one cow, one horse, one mule, five sheep, or five goats) for 30 days.
** See description of the map unit for composition and behavior characteristics of the map unit.
*** Indicates that the crop is grown on the soil, but yield data is not available.

TABLE 7.--STORIE INDEX RATING

[Absence of an entry indicates that the map unit as a whole or the individual components were not rated]

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
101	Aiken-Sobrante association, 5 to 15 percent slopes	---	---	---	---	57*	3	---
	Aiken part	80	95	85	95	---	---	Nutrient level.
	Sobrante part	70	95	85	95	---	---	Nutrient level.
102	Aiken-Sobrante association, 15 to 30 percent slopes	---	---	---	---	50*	3	---
	Aiken part	80	95	75	90	---	---	Nutrient level.
	Sobrante part	70	95	75	95	---	---	Nutrient level.
103	Asbill clay loam, 5 to 8 percent slopes	80	85	90	95	58	3	Nutrient level.
104	Asbill clay loam, 8 to 15 percent slopes	80	85	85	95	55	3	Nutrient level.
105	Badland**	---	---	---	---	---	6	---
106	Bally-Phipps gravelly loams, 2 to 8 percent slopes	---	---	---	---	61*	2	---
	Bally part	85	80	95	95	---	---	Nutrient level.
	Phipps part	85	80	95	95	---	---	Nutrient level.
107	Bally-Phipps complex, 15 to 30 percent slopes	---	---	---	---	51*	3	---
	Bally part	85	80	75	95	---	---	Nutrient level.
	Phipps part	85	90	75	95	---	---	Nutrient level.
108	Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes	---	---	---	---	19*	5	---
	Bally part	85	80	30	95	---	---	Nutrient level.
	Phipps part	85	90	30	95	---	---	Nutrient level.
	Haploxeralfs part	90	70	30	95	---	---	Nutrient level.
109	Bamtush-Neuns gravelly loams, 15 to 30 percent slopes	---	---	---	---	38*	4	---
	Bamtush part	90	70	75	95	---	---	Nutrient level.
	Neuns part	60	65	75	95	---	---	Nutrient level.
110	Bamtush-Speaker-Sanhedrin gravelly loams, 30 to 50 percent slopes	---	---	---	---	22*	4	---
	Bamtush part	90	70	40	95	---	---	Nutrient level.
	Speaker part	55	85	40	95	---	---	Nutrient level.
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
111	Bamtush-Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes	---	---	---	---	14*	5	---
	Bamtush part	90	70	25	95	---	---	Nutrient level.
	Speaker part	55	85	25	95	---	---	Nutrient level.
	Sanhedrin part	85	80	25	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
112	Benridge-Konocti association, 15 to 30 percent slopes	---	---	---	---	42*	3	---
	Benridge part	85	90	75	95	---	---	Nutrient level.
	Konocti cobbly loam part	70	65	75	95	---	---	Nutrient level.
	Konocti stony loam part	55	65	75	95	---	---	Nutrient level.
113	Benridge-Konocti association, 30 to 50 percent slopes	---	---	---	---	22*	4	---
	Benridge part	85	90	40	95	---	---	Nutrient level.
	Konocti cobbly loam part	70	65	40	95	---	---	Nutrient level.
	Konocti stony loam part	55	65	40	95	---	---	Nutrient level.
114	Benridge-Sodabay loams, 8 to 15 percent slopes	---	---	---	---	63*	2	---
	Benridge part	85	90	85	95	---	---	Nutrient level.
	Sodabay part	85	95	85	95	---	---	Nutrient level.
115	Benridge-Sodabay loams, 15 to 30 percent slopes	---	---	---	---	56*	3	---
	Benridge part	85	90	75	95	---	---	Nutrient level.
	Sodabay part	85	95	75	95	---	---	Nutrient level.
116	Benridge Variant loam, 2 to 15 percent slopes	45	95	90	90	35	4	Nutrient level.
117	Bottlerock-Glenview-Arrowhead complex, 5 to 30 percent slopes	---	---	---	---	29*	4	---
	Bottlerock part	85	40	80	90	---	---	Nutrient level.
	Glenview part	80	70	80	90	---	---	Nutrient level.
	Arrowhead part	60	65	80	90	---	---	Nutrient level.
118	Bottlerock-Glenview-Arrowhead complex, 30 to 50 percent slopes	---	---	---	---	15*	5	---
	Bottlerock part	85	40	40	90	---	---	Nutrient level.
	Glenview part	80	70	40	90	---	---	Nutrient level.
	Arrowhead part	60	65	40	90	---	---	Nutrient level.
119	Bressa-Millsholm loams, 8 to 15 percent slopes	---	---	---	---	36*	4	---
	Bressa part	55	100	85	95	---	---	Nutrient level.
	Millsholm part	30	95	85	95	---	---	Nutrient level.
120	Bressa-Millsholm loams, 15 to 30 percent slopes	---	---	---	---	31*	4	---
	Bressa part	55	100	75	95	---	---	Nutrient level.
	Millsholm part	30	95	75	95	---	---	Nutrient level.
121	Clear Lake clay, drained, cool	90	60	100	80x95x 95	39	4	Drainage, flooding, nutrient level.
122	Clear Lake Variant clay, drained	90	60	100	80x95	41	3	Drainage, flooding.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
123	Cole clay loam, drained	95	85	100	90x95	69	2	Drainage, flooding.
124	Cole Variant clay loam	90	85	100	95x95	69	2	Drainage, flooding.
125	Cole Variant clay loam, calcareous substratum	90	85	100	95x95x90	62	2	Drainage, flooding.
126	Collayomi complex, 50 to 75 percent slopes	---	---	---	---	11*	5	---
	Collayomi very gravelly loam part	90	55	25	95	---	---	Nutrient level.
	Collayomi stony loam part	85	50	25	95	---	---	Nutrient level.
127	Collayomi-Aiken-Whispering complex, 5 to 30 percent slopes	---	---	---	---	45*	3	---
	Collayomi part	90	60	80	95	---	---	Nutrient level.
	Aiken part	80	95	80	90	---	---	Nutrient level.
	Whispering part	55	80	80	95	---	---	Nutrient level.
128	Collayomi-Aiken-Whispering complex, 30 to 50 percent slopes	---	---	---	---	23*	4	---
	Collayomi part	90	60	40	95	---	---	Nutrient level.
	Aiken part	80	95	40	90	---	---	Nutrient level.
	Whispering part	55	80	40	95	---	---	Nutrient level.
129	Collayomi-Whispering complex, 30 to 50 percent slopes	---	---	---	---	19*	5	---
	Collayomi part	90	60	40	95	---	---	Nutrient level.
	Whispering part	55	80	40	95	---	---	Nutrient level.
130	Deadwood-Sheetiron association, 50 to 75 percent slopes	---	---	---	---	5*	6	---
	Deadwood part	35	50	25	90	---	---	Nutrient level.
	Sheetiron part	60	60	25	90	---	---	Nutrient level.
131	Fluvaquentic Haplaquolls, nearly level	80	90	100	25	18	5	Drainage, flooding.
132	Forbesville loam, 2 to 5 percent slopes	50	95	95	95x90	39	4	Drainage, nutrient level.
133	Forbesville loam, 5 to 15 percent slopes	50	95	85	95x90	35	4	Drainage, nutrient level.
134	Forward Variant-Kidd association, 30 to 50 percent slopes	---	---	---	---	12*	5	---
	Forward Variant part	95	65	40	95	---	---	Nutrient level.
	Kidd part	35	70	40	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
135	Forward Variant-Kidd association, 50 to 75 percent slopes	---	---	---	---	12*	5	---
	Forward Variant part	95	65	25	95	---	---	Nutrient level.
	Kidd part	35	70	25	95	---	---	Nutrient level.
136	Freezeout-Yollabolly very gravelly sandy loams, 30 to 50 percent slopes	---	---	---	---	9*	6	---
	Freezeout part	55	50	40	90	---	---	Nutrient level.
	Yollabolly part	35	50	40	90	---	---	Nutrient level.
137	Freezeout-Yollabolly very gravelly sandy loams, 50 to 75 percent slopes	---	---	---	---	5*	6	---
	Freezeout part	55	50	25	90	--	---	Nutrient level.
	Yollabolly part	35	50	25	90	--	---	Nutrient level.
138	Glenview-Arrowhead complex, 5 to 15 percent slopes	---	---	---	---	38*	4	---
	Glenview part	80	70	85	95x90	---	---	Erosion, nutrient level.
	Arrowhead part	60	65	85	95x90	---	---	Erosion, nutrient level.
139	Glenview-Arrowhead complex, 15 to 30 percent slopes	---	---	---	---	31*	4	---
	Glenview part	80	70	75	90x90	---	---	Erosion, nutrient level.
	Arrowhead part	60	65	75	90x90	---	---	Erosion, nutrient level.
140	Glenview-Bottlerock complex, 2 to 5 percent slopes	---	---	---	---	40*	3	---
	Glenview part	80	70	95	95x90	---	---	Erosion, nutrient level.
	Bottlerock part	85	40	95	95x90	---	---	Erosion, nutrient level.
141	Henneke-Montara complex, 8 to 15 percent slopes	---	---	---	---	14*	5	---
	Henneke part	40	60	85	60	---	---	Toxicity.
	Montara part	35	75	85	70	---	---	Toxicity.
142	Henneke-Montara-Rock outcrop complex, 15 to 50 percent slopes	---	---	---	---	7*	6	---
	Henneke part	40	60	55	60	---	---	Toxicity.
	Montara part	35	75	55	70	---	---	Toxicity.
	Rock outcrop part	---	---	---	---	---	---	---
143	Henneke-Okiota complex, 30 to 50 percent slopes	---	---	---	---	6*	6	---
	Henneke part	40	60	40	60	---	---	Toxicity.
	Okiota part	35	75	40	60	---	---	Toxicity.
144	Jafa loam, 2 to 5 percent slopes	85	90	95	90	65	2	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
145	Jafa loam, 5 to 15 percent slopes	85	90	85	90	59	3	Nutrient level.
146	Jafa complex, 5 to 30 percent slopes	---	---	---	---	53*	3	---
	Jafa loam part	85	90	80	90	---	---	Nutrient level.
	Jafa gravelly loam part	85	80	80	90	---	---	Nutrient level.
147	Kelsey fine sandy loam	95	100	100	95	90	1	Flooding.
148	Kidd-Forward complex, 5 to 30 percent slopes	---	---	---	---	25*	4	---
	Kidd part	40	70	80	95	---	---	Nutrient level.
	Forward part	55	90	80	95	---	---	Nutrient level.
149	Kidd-Forward complex, 30 to 50 percent slopes	---	---	---	---	14*	5	---
	Kidd part	40	70	40	95	---	---	Nutrient level.
	Forward part	55	90	40	95	---	---	Nutrient level.
150	Kilaga Variant loam, 0 to 5 percent slopes	80	100	95	90x95	65	2	Drainage, nutrient level.
151	Konocti-Benridge complex, 50 to 75 percent slopes	---	---	---	---	11*	5	---
	Konocti stony loam part	55	65	25	95	---	---	Nutrient level.
	Konocti cobbly loam part	70	65	25	95	---	---	Nutrient level.
	Benridge part	85	90	25	95	---	---	Nutrient level.
152	Konocti-Hambright complex, 5 to 15 percent slopes	---	---	---	---	29*	4	---
	Konocti part	60	70	85	95	---	---	Nutrient level.
	Hambright part	35	65	85	95	---	---	Nutrient level.
153	Konocti-Hambright complex, 15 to 30 percent slopes	---	---	---	---	24*	4	---
	Konocti part	60	70	75	95	---	---	Nutrient level.
	Hambright part	35	65	75	95	---	---	Nutrient level.
154	Konocti-Hambright-Rock outcrop complex, 30 to 75 percent slopes	---	---	---	---	7*	6	---
	Konocti part	60	70	30	95	---	---	Nutrient level.
	Hambright part	35	65	30	95	---	---	Nutrient level.
	Rock outcrop part	---	---	---	---	---	---	---
155	Konocti Variant-Konocti-Hambright complex, 2 to 15 percent slopes	---	---	---	---	37*	4	---
	Konocti Variant part	85	65	90	95	---	---	Nutrient level.
	Konocti part	55	65	90	95	---	---	Nutrient level.
	Hambright part	35	60	90	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
156	Konocti Variant-Konocti-Hambright complex, 15 to 30 percent slopes	---	---	---	---	31*	4	---
	Konocti Variant part	85	65	75	95	---	---	Nutrient level.
	Konocti part	55	65	75	95	---	---	Nutrient level.
	Hambright part	35	60	75	95	---	---	Nutrient level.
157	Landlow Variant silty clay loam	95	90	100	40x90	32	4	Drainage, flooding.
158	Lupoyoma silt loam, protected	100	100	100	95x95	90	1	Drainage, flooding.
159	Manzanita loam, 2 to 5 percent slopes	85	95	95	95	73	2	Nutrient level.
160	Manzanita loam, 5 to 15 percent slopes	85	95	85	95	65	2	Nutrient level.
161	Manzanita loam, 15 to 25 percent slopes	85	95	75	95	58	3	Nutrient level.
162	Manzanita gravelly loam, 2 to 8 percent slopes	80	80	95	95	58	3	Nutrient level.
163	Manzanita gravelly loam, 8 to 25 percent slopes	80	80	80	95	49	3	Nutrient level.
164	Maxwell clay loam, 0 to 2 percent slopes	95	85	100	80x80	52	3	Drainage, toxicity.
165	Maxwell clay loam, 2 to 8 percent slopes	95	85	95	80x80	49	3	Drainage, toxicity.
166	Maymen-Etsel-Mayacama complex, 15 to 30 percent slopes	---	---	---	---	18*	5	---
	Maymen part	35	80	75	95	---	---	Nutrient level.
	Etsel part	25	75	75	90	---	---	Nutrient level.
	Mayacama part	60	50	75	90	---	---	Nutrient level.
167	Maymen-Etsel-Mayacama complex, 30 to 75 percent slopes	---	---	---	---	7*	6	---
	Maymen part	35	80	30	95	---	---	Nutrient level.
	Etsel part	20	75	30	90	---	---	Nutrient level.
	Mayacama part	60	50	30	90	---	---	Nutrient level.
168	Maymen-Etsel-Snook complex, 15 to 30 percent slopes	---	---	---	---	16*	5	---
	Maymen part	35	80	75	95	---	---	Nutrient level.
	Etsel part	20	75	75	90	---	---	Nutrient level.
	Snook part	15	95	75	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
169	Maymen-Etsel-Snook complex, 30 to 75 percent slopes--	---	---	---	---	6*	6	---
	Maymen part	35	80	30	95	---	---	Nutrient level.
	Etsel part	20	75	30	90	---	---	Nutrient level.
	Snook part	15	95	30	95	---	---	Nutrient level.
170	Maymen-Etsel-Speaker association, 30 to 50 percent slopes	---	---	---	---	11*	5	---
	Maymen part	35	80	40	95	---	---	Nutrient level.
	Etsel part	25	65	40	90	---	---	Nutrient level.
	Speaker part	55	85	40	95	---	---	Nutrient level.
171	Maymen-Hopland-Etsel association, 15 to 50 percent slopes	---	---	---	---	21*	4	---
	Maymen part	35	80	55	95	---	---	Nutrient level.
	Hopland part	70	95	55	95	---	---	Nutrient level.
	Etsel part	25	75	55	90	---	---	Nutrient level.
172	Maymen-Hopland-Mayacama complex, 9 to 30 percent slopes	---	---	---	---	32*	4	---
	Maymen part	35	80	80	95	---	---	Nutrient level.
	Hopland part	70	95	80	95	---	---	Nutrient level.
	Mayacama part	60	50	80	90	---	---	Nutrient level.
173	Maymen-Hopland-Mayacama association, 30 to 50 percent slopes	---	---	---	---	14*	5	---
	Maymen part	35	80	40	95	---	---	Nutrient level.
	Hopland part	70	95	40	95	---	---	Nutrient level.
	Mayacama part	60	50	40	90	---	---	Nutrient level.
174	Maymen-Hopland-Mayacama association, 50 to 75 percent slopes	---	---	---	---	9*	6	---
	Maymen part	35	80	25	95	---	---	Nutrient level.
	Hopland part	70	95	25	95	---	---	Nutrient level.
	Mayacama part	60	50	25	90	---	---	Nutrient level.
175	Maymen-Millsholm-Bressa complex, 30 to 50 percent slopes	---	---	---	---	13*	5	---
	Maymen part	35	80	40	95	---	---	Nutrient level.
	Millsholm part	30	95	40	95	---	---	Nutrient level.
	Bressa part	55	100	40	95	---	---	Nutrient level.
176	Maywood Variant sandy loam	95	95	100	90	81	1	Flooding.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
177	Millsholm-Bressa loams, 30 to 50 percent slopes	---	---	---	---	15*	5	---
	Millsholm part	30	95	40	95	---	---	Nutrient level.
	Bressa part	55	100	40	95	---	---	Nutrient level.
178	Millsholm-Bressa-Hopland association, 30 to 50 percent slopes	---	---	---	---	16*	5	---
	Millsholm part	30	95	40	95	---	---	Nutrient level.
	Bressa part	55	100	40	95	---	---	Nutrient level.
	Hopland part	65	95	40	95	---	---	Nutrient level.
179	Millsholm-Squawrock-Pomo complex, 30 to 50 percent slopes	---	---	---	---	20*	4	---
	Millsholm part	30	95	40	95	---	---	Nutrient level.
	Squawrock part	70	80	40	95	---	---	Nutrient level.
	Pomo part	85	95	40	95	---	---	Nutrient level.
180	Mocho Variant loam	95	90	100	100	86	1	None.
181	Neice-Sobrante-Hambright complex, 15 to 30 percent slopes	---	---	---	---	38*	4	---
	Neice part	85	75	75	90	---	---	Nutrient level.
	Sobrante part	70	95	75	95	---	---	Nutrient level.
	Hambright part	35	60	75	95	---	---	Nutrient level.
182	Neice-Sobrante-Hambright complex, 30 to 75 percent slopes	---	---	---	---	15*	5	---
	Neice part	85	75	30	90	---	---	Nutrient level.
	Sobrante part	70	95	30	95	---	---	Nutrient level.
	Hambright part	35	60	30	95	---	---	Nutrient level.
183	Neuns-Bamtush-Deadwood association, 30 to 50 percent slopes	---	---	---	---	16*	5	---
	Neuns part	60	65	40	95	---	---	Nutrient level.
	Bamtush part	90	70	40	95	---	---	Nutrient level.
	Deadwood part	35	50	40	90	---	---	Nutrient level.
184	Neuns-Deadwood-Bamtush association, 50 to 75 percent slopes	---	---	---	---	9*	6	---
	Neuns part	60	65	25	95	---	---	Nutrient level.
	Deadwood part	35	50	25	90	---	---	Nutrient level.
	Bamtush part	90	70	25	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
185	Neuns-Decy-Sanhedrin complex, 30 to 50 percent slopes	---	---	---	---	16*	5	---
	Neuns part	60	65	40	95	---	---	Nutrient level.
	Decy part	50	70	40	90	---	---	Nutrient level.
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
186	Neuns-Sanhedrin-Deadwood complex, 30 to 50 percent slopes	---	---	---	---	17*	5	---
	Neuns part	60	65	40	95	---	---	Nutrient level.
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
	Deadwood part	35	50	40	90	---	---	Nutrient level.
187	Neuns-Sanhedrin-Deadwood complex, 50 to 75 percent slopes	---	---	---	---	10*	5	---
	Neuns part	60	65	25	95	---	---	Nutrient level.
	Sanhedrin part	85	80	25	95	---	---	Nutrient level.
	Deadwood part	35	50	25	90	---	---	Nutrient level.
188	Neuns-Sanhedrin-Speaker gravelly loams, 30 to 50 percent slopes	---	---	---	---	19*	5	---
	Neuns part	60	65	40	95	---	---	Nutrient level.
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
	Speaker part	55	85	40	95	---	---	Nutrient level.
189	Neuns-Sheetiron-Deadwood complex, 30 to 50 percent slopes	---	---	---	---	12*	5	---
	Neuns part	60	65	40	95	---	---	Nutrient level.
	Sheetiron part	60	60	40	90	---	---	Nutrient level.
	Deadwood part	35	50	40	90	---	---	Nutrient level.
190	Neuns-Sheetiron-Deadwood complex, 50 to 75 percent slopes	---	---	---	---	7*	6	---
	Neuns part	60	65	25	95	---	---	Nutrient level.
	Sheetiron part	60	60	25	90	---	---	Nutrient level.
	Deadwood part	35	50	25	90	---	---	Nutrient level.
191	Neuns-Speaker gravelly loams, 15 to 30 percent slopes	---	---	---	---	30*	4	---
	Neuns part	60	65	75	95	---	---	Nutrient level.
	Speaker part	55	85	75	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
192	Okiota-Henneke complex, 5 to 30 percent slopes	---	---	---	---	12*	5	---
	Okiota part	35	75	80	60	---	---	Toxicity.
	Henneke part	40	60	80	60	---	---	Toxicity.
193	Okiota-Henneke-Dubakella association, 15 to 50 percent slopes	---	---	---	---	9*	6	---
	Okiota part	35	75	55	60	---	---	Toxicity.
	Henneke part	40	60	55	60	---	---	Toxicity.
	Dubakella part	60	60	55	60	---	---	Toxicity.
194	Oxalis Variant silt loam	95	100	100	60	57	3	Drainage.
195	Phipps complex, 5 to 15 percent slopes	---	---	---	---	55*	3	---
	Phipps clay loam part	80	85	85	95x95	---	---	Nutrient level, slumping.
	Phipps loam part	85	90	85	95x95	---	---	Nutrient level, slumping.
196	Phipps complex, 15 to 30 percent slopes	---	---	---	---	45*	3	---
	Phipps clay loam part	80	85	75	95x90	---	---	Nutrient level, slumping.
	Phipps loam part	85	90	75	95x90	---	---	Nutrient level, slumping.
197	Phipps complex, 30 to 50 percent slopes	---	---	---	---	24*	4	---
	Phipps clay loam part	80	85	40	95x90	---	---	Nutrient level, slumping.
	Phipps loam part	85	90	40	95x90	---	---	Nutrient level, slumping.
198	Pomo-Bressa loams, 15 to 50 percent slopes	---	---	---	---	39*	4	---
	Pomo part	85	95	55	95	---	---	Nutrient level.
	Bressa part	55	100	55	95	---	---	Nutrient level.
199	Riverwash	---	---	---	---	---	6	---
200	Rock outcrop-Etsel-Snook complex, 50 to 80 percent slopes	---	---	---	---	1*	6	---
	Rock outcrop part	---	---	---	---	---	---	Nutrient level.
	Etsel part	20	75	25	95	---	---	Nutrient level.
	Snook part	15	95	25	95	---	---	---
201	Sanhedrin-Kekawaka-Speaker complex, 15 to 30 percent slopes	---	---	---	---	46*	3	---
	Sanhedrin part	85	80	75	95	---	---	Nutrient level.
	Kekawaka part	80	90	75	90	---	---	Nutrient level.
	Speaker part	55	85	75	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
202	Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes	---	---	---	---	24*	4	---
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
	Kekawaka part	80	90	40	90	---	---	Nutrient level.
	Speaker part	55	85	40	95	---	---	Nutrient level.
203	San Joaquin Variant fine sandy loam, 0 to 5 percent slopes	35	100	95	95x90	28	4	Drainage, nutrient level.
204	Sheetiron-Deadwood association, 30 to 50 percent slopes	---	---	---	---	10*	5	---
	Sheetiron part	60	60	40	90	---	---	Nutrient level.
	Deadwood part	35	50	40	90	---	---	Nutrient level.
205	Sheetiron-Deadwood association, 50 to 75 percent slopes	---	---	---	---	7*	6	---
	Sheetiron part	60	60	25	90	---	---	Nutrient level.
	Deadwood part	35	50	25	90	---	---	Nutrient level.
206	Shortyork Variant-Yorkville-Squawrock association, 15 to 50 percent slopes	---	---	---	---	28*	4	---
	Shortyork part	60	70	55	95	---	---	Nutrient level.
	Yorkville part	90	80	55	95x90	---	---	Drainage, nutrient level.
	Squawrock part	70	80	55	95	---	---	Nutrient level.
207	Skyhigh-Asbill complex, 8 to 15 percent slopes	---	---	---	---	52*	3	---
	Skyhigh part	70	90	85	95	---	---	Nutrient level.
	Asbill part	80	85	85	95	---	---	Nutrient level.
208	Skyhigh-Asbill complex, 15 to 50 percent slopes	---	---	---	---	34*	4	---
	Skyhigh part	70	90	55	95	---	---	Nutrient level.
	Asbill part	80	85	55	95	---	---	Nutrient level.
209	Skyhigh-Millsholm loams, 15 to 50 percent slopes	---	---	---	---	27*	4	---
	Skyhigh part	70	90	55	95	---	---	Nutrient level.
	Millsholm part	35	95	55	95	---	---	Nurtient level.
210	Skyhigh-Sleeper-Millsholm association, 8 to 15 percent slopes	---	---	---	---	50*	3	---
	Skyhigh part	70	90	85	95	---	---	Nutrient level.
	Sleeper part	80	100	85	95	---	---	Nutrient level.
	Millsholm part	35	95	85	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
211	Skyhigh-Sleeper-Millsholm association, 15 to 30 percent slopes	---	---	---	---	44*	3	---
	Skyhigh part	70	90	75	95x95	---	---	Nutrient level, slumping.
	Sleeper part	80	100	75	95x95	---	---	Nutrient level, slumping.
	Millsholm part	40	95	75	95	---	---	Nutrient level.
212	Skyhigh-Sleeper-Millsholm association, 30 to 50 percent slopes	---	---	---	---	22*	4	---
	Skyhigh part	70	90	40	95x95	---	---	Nutrient level, slumping.
	Sleeper part	80	100	40	95x95	---	---	Nutrient level, slumping.
	Millsholm part	40	95	40	95	---	---	Nutrient level.
213	Sleeper Variant-Sleeper loams, 5 to 15 percent slopes	---	---	---	---	64*	2	---
	Sleeper Variant part	85	100	85	95x95	---	---	Nutrient level, slumping.
	Sleeper part	80	100	85	95x95	---	---	Nutrient level, slumping.
214	Sleeper Variant-Sleeper loams, 15 to 30 percent slopes	---	---	---	---	56*	3	---
	Sleeper Variant part	85	100	75	95x95	---	---	Nutrient level, slumping.
	Sleeper part	80	100	75	95x95	---	---	Nutrient level, slumping.
215	Sleeper Variant-Sleeper loams, 30 to 50 percent slopes	---	---	---	---	30*	4	---
	Sleeper Variant part	85	100	40	95x95	---	---	Nutrient level, slumping.
	Sleeper part	80	100	40	95x95	---	---	Nutrient level, slumping.
216	Sobrante-Collayomi-Whispering association, 15 to 30 percent slopes	---	---	---	---	37*	4	---
	Sobrante part	70	80	75	95	---	---	Nutrient level.
	Collayomi part	90	60	75	95	---	---	Nutrient level.
	Whispering part	55	80	75	95	---	---	Nutrient level.
217	Sobrante-Collayomi-Whispering association, 30 to 50 percent slopes	---	---	---	---	20*	4	---
	Sobrante part	70	80	40	95	---	---	Nutrient level.
	Collayomi part	90	60	40	95	---	---	Nutrient level.
	Whispering part	55	80	40	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
218	Sobrante-Guenoc-Hambright complex, 2 to 15 percent slopes	---	---	---	---	38*	4	---
	Sobrante part	70	80	90	95	---	---	Nutrient level.
	Guenoc part	60	80	90	90	---	---	Nutrient level.
	Hambright part	35	60	90	95	---	---	Nutrient level.
219	Sobrante-Guenoc-Hambright complex, 15 to 30 percent slopes	---	---	---	---	31*	4	---
	Sobrante part	70	80	75	95	---	---	Nutrient level.
	Guenoc part	60	80	75	90	---	---	Nutrient level.
	Hambright part	35	60	75	95	---	---	Nutrient level.
220	Sobrante-Hambright-Guenoc complex, 30 to 50 percent slopes	---	---	---	---	16*	5	---
	Sobrante part	70	80	40	95	---	---	Nutrient level.
	Hambright part	35	60	40	95	---	---	Nutrient level.
	Guenoc part	60	80	40	90	---	---	Nutrient level.
221	Sodabay loam, 5 to 15 percent slopes	85	95	85	95	65	2	Nutrient level.
222	Sodabay loam, 15 to 30 percent slopes	85	95	75	95	56	3	Nutrient level.
223	Sodabay-Konocti association, 5 to 30 percent slopes	---	---	---	---	49*	3	---
	Sodabay part	85	95	80	95	---	---	Nutrient level.
	Konocti cobbly loam part	70	65	80	95	---	---	Nutrient level.
	Konocti stony loam part	55	65	80	95	---	---	Nutrient level.
224	Speaker-Marpa-Sanhedrin gravelly loams, 30 to 50 percent slopes	---	---	---	---	19*	5	---
	Speaker part	55	85	40	95	---	---	Nutrient level.
	Marpa part	50	85	40	95	---	---	Nutrient level.
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
225	Speaker-Maymen-Marpa association, 30 to 50 percent slopes	---	---	---	---	15*	5	---
	Speaker part	55	85	40	95	---	---	Nutrient level.
	Maymen part	35	80	40	95	---	---	Nutrient level.
	Marpa part	50	85	40	95	---	---	Nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors A	B	C	X	Index	Grade	Limitation in X factor
226	Speaker-Maymen-Marpa association, 50 to 75 percent slopes	---	---	---	---	9*	6	---
	Speaker part	55	85	25	95	---	---	Nutrient level.
	Maymen part	35	80	25	95	---	---	Nutrient level.
	Marpa part	50	85	25	95	---	---	Nutrient level.
227	Speaker-Maymen-Millsholm association, 30 to 50 percent slopes	---	---	---	---	19*	5	---
	Speaker part	75	95	40	95	---	---	Nutrient level.
	Maymen part	35	80	40	95	---	---	Nutrient level.
	Millsholm part	40	95	40	95	---	---	Nutrient level.
228	Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes	---	---	---	---	13*	5	---
	Speaker part	55	85	25	95	---	---	Nutrient level.
	Sanhedrin part	85	80	25	95	---	---	Nutrient level.
229	Speaker-Sanhedrin-Maymen association, 30 to 50 percent slopes	---	---	---	---	19*	5	---
	Speaker part	55	85	40	95	---	---	Nutrient level.
	Sanhedrin part	85	80	40	95	---	---	Nutrient level.
	Maymen part	35	80	40	95	---	---	Nutrient level.
230	Speaker-Speaker Variant-Sanhedrin association, 5 to 30 percent slopes	---	---	---	---	38*	3	---
	Speaker part	55	85	80	95	---	---	Nutrient level.
	Speaker Variant part	45	90	80	95	---	---	Nutrient level.
	Sanhedrin part	85	80	80	95	---	---	Nutrient level.
231	Squawrock-Shortyork Variant gravelly loams, 15 to 30 percent slopes	---	---	---	---	35*	3	---
	Squawrock part	70	80	75	95	---	---	Nutrient level.
	Shortyork Variant part	60	70	75	95	---	---	Nutrient level.
232	Still loam	100	95	100	95	90	1	Flooding.
233	Still loam, stratified substratum	95	90	100	95	81	1	Flooding.
234	Still gravelly loam	100	80	100	95x95	72	2	Flooding, nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
235	Still-Talmage complex, 2 to 8 percent slopes	---	---	---	---	60*	2	---
	Still part	100	80	95	95x95	---	---	Flooding, nutrient level.
	Talmage part	100	55	95	95x90	---	---	Flooding, nutrient level.
236	Stonyford-Guenoc complex, 30 to 50 percent slopes	---	---	---	---	13*	5	---
	Stonyford part	30	80	40	95	---	---	Nutrient level.
	Guenoc part	60	85	40	90	---	---	Nutrient level.
237	Talmage very gravelly sandy loam	100	55	100	95x90	47	3	Flooding, nutrient level.
238	Tulelake silty clay loam, flooded	95	90	100	75x40	26	4	Flooding, drainage.
239	Tulelake silty clay loam, protected	95	90	100	60	51	3	Drainage.
240	Tyson-Neuns gravelly loams, 30 to 75 percent slopes	---	---	---		11*	5	---
	Tyson part	55	65	30	95	---	---	Nutrient level.
	Neuns part	60	65	30	95	---	---	Nutrient level.
241	Vitrandepts-Cinder land complex, 15 to 75 percent slopes	---	---	---	---	9*	6	---
	Vitrandepts part	75	60	40	95	---	---	Nutrient level.
	Cinder land part	---	---	---	---	---	---	---
242	Wappo loam, 2 to 8 percent slopes	40	100	95	90x95	32	4	Nutrient level, drainage.
243	Wappo loam, 8 to 15 percent slopes	40	100	85	90x95	29	4	Nutrient level, drainage.
244	Wappo Variant clay loam, 2 to 8 percent slopes	40	85	95	90x95	28	4	Nutrient level, drainage.
245	Whispering-Collayomi complex, 50 to 75 percent slopes	---	---	---	---	11*	5	---
	Whispering part	55	80	25	95	---	---	Nutrient level.
	Collayomi very gravelly loam part	90	60	25	95	---	---	Nutrient level.
	Collayomi stony loam part	85	50	25	95	---	---	Nutrient level.
246	Wolfcreek gravelly loam	90	80	100	95x95	65	2	Flooding, nutrient level.
247	Wolfcreek loam	95	100	100	95	90	1	Flooding.
248	Xerofluvents, very gravelly	80	50	100	90x90	32	4	Flooding, nutrient level.

See footnotes at end of table.

TABLE 7.--STORIE INDEX RATING--Continued

Map symbol	Map unit designation	Rating factors				Index	Grade	Limitation in X factor
		A	B	C	X			
249	Xerofluvents-Riverwash complex	---	---	---	---	17*	5	---
	Xerofluvents part	80	50	100	75x90	---	---	Flooding, nutrient level.
	Riverwash part	---	---	---	---	---	---	---
250	Yollabolly-Freezeout very gravelly sandy loams, 30 to 50 percent slopes	---	---	---	---	5*	6	---
	Yollabolly part	35	50	25	90	---	---	Nutrient level.
	Freezeout part	55	50	25	90	---	---	Nutrient level.
251	Yollabolly-Rock outcrop-Freezeout complex, 50 to 75 percent slopes	---	---	---	---	3*	6	---
	Yollabolly part	35	50	25	90	---	---	Nutrient level.
	Rock outcrop part	---	---	---	---	---	---	---
	Freezeout part	55	50	25	90	---	---	Nutrient level.
252	Yorktree-Hopland-Squawrock complex, 15 to 50 percent slopes	---	---	---	---	34*	4	---
	Yorktree part	85	80	55	95	---	---	Nutrient level.
	Hopland part	70	95	55	95	---	---	Nutrient level.
	Squawrock part	70	80	55	95	---	---	Nutrient level.
253	Yorkville-Pomo complex, 15 to 50 percent slopes	---	---	---	---	38*	4	---
	Yorkville part	90	80	55	95x90	---	---	Drainage, nutrient level.
	Pomo part	85	95	55	95	---	---	Nutrient level.
254	Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes	---	---	---	---	35*	4	---
	Yorkville part	90	80	55	95x90	---	---	Drainage, nutrient level.
	Yorktree part	85	80	55	95	---	---	Nutrient level.
	Squawrock part	70	80	55	95	---	---	Nutrient level.
255	Yorkville Variant clay loam, 2 to 8 percent slopes	80	80	95	70	43	3	Toxicity.

*Weighted average.
**Too variable to rate.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES

[Only the soils that support rangeland vegetation suitable for grazing are listed, except for those that are in map units that include such soils]

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
103, 104---------- Asbill	Annual Grass-Claypan (15)-----	Favorable	2,500	Wild oat----------	30
		Normal	1,800	Soft chess----------	30
		Unfavorable	1,100	Ripgut brome----------	10
				Foxtail fescue----------	5
				Blue oak----------	5
116---------- Benridge Variant	Blue Oak-Annual Grass-Claypan (15).	Favorable	2,500	Soft chess----------	15
		Normal	1,800	Whitestem filaree----------	10
		Unfavorable	1,200	Clover----------	10
				Ripgut brome----------	5
				Bluegrass----------	5
				Blue wildrye----------	5
				Bluedick----------	5
				Manzanita----------	5
				Blue oak----------	5
				Bulbous oniongrass----------	5
119*, 120*: Bressa----------	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,600	Soft chess----------	20
		Normal	2,600	Wild oat----------	20
		Unfavorable	1,400	Blue wildrye----------	15
				California brome----------	5
				Ripgut brome----------	5
				Red brome----------	5
				Filaree----------	5
Millsholm---------	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable	1,800	Soft chess----------	15
		Normal	1,400	Filaree----------	15
		Unfavorable	1,000	Manzanita----------	15
				Wild oat----------	10
				Ripgut brome----------	10
				Blue oak----------	10
				Blue wildrye----------	5
				Clover----------	5
132, 133---------- Forbesville	Blue Oak-Annual Grass-Clayey Terrace (14).	Favorable	2,800	Soft chess----------	20
		Normal	2,200	Manzanita----------	15
		Unfavorable	1,500	Wild oat----------	15
				Ceanothus----------	10
				Ripgut brome----------	10
				Bedstraw----------	10
				Chamise----------	5
				California scrub oak----------	5
				Blue wildrye----------	5
147---------- Kelsey	Annual Grass-Loamy Bottomland (14).	Favorable	3,500	Wild oat----------	25
		Normal	2,500	Filaree----------	15
		Unfavorable	1,500	Soft chess----------	10
				Vetch----------	5
				Yellow starthistle----------	5
				Ripgut brome----------	5
				Burclover----------	5
				Foxtail barley----------	5
150---------- Kilaga Variant	Annual Grass-Loamy Bottomland (14).	Favorable	3,200	Soft chess----------	40
		Normal	2,800	Burclover----------	20
		Unfavorable	1,000	Wild oat----------	10
				Filaree----------	10
				Foxtail fescue----------	5
				Lovegrass----------	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
152*, 153*:					
Konocti	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,500	Manzanita	30
		Normal	1,200	Chamise	25
		Unfavorable	800	Buckbrush	10
				California scrub oak	10
				Toyon	5
				Pitchersage	5
				Red brome	5
Hambright	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5
154*:					
Konocti	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,500	Manzanita	30
		Normal	1,200	Chamise	25
		Unfavorable	800	Buckbrush	10
				California scrub oak	10
				Toyon	5
				Pitchersage	5
				Red brome	5
Hambright	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5
Rock outcrop.					
155*:					
Konocti Variant	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,500	Manzanita	15
		Normal	1,000	Mountainmahogany	10
		Unfavorable	600	Ceanothus	10
				Wild oat	5
				Soft chess	5
				Red brome	5
				Dogtail	5
Konocti	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,500	Manzanita	30
		Normal	1,200	Chamise	25
		Unfavorable	800	Buckbrush	10
				California scrub oak	10
				Toyon	5
				Pitchersage	5
				Red brome	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
155*:					
Hambright	Live Oak-Manzanita (15)	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5
156*:					
Konocti Variant	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,500	Manzanita	15
		Normal	1,000	Mountainmahogany	10
		Unfavorable	600	Ceanothus	10
				Wild oat	5
				Soft chess	5
				Red brome	5
				Dogtail	5
Konocti	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,500	Manzanita	30
		Normal	1,200	Chamise	25
		Unfavorable	800	Buckbrush	10
				California scrub oak	10
				Toyon	5
				Pitchersage	5
				Red brome	5
Hambright	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5
159, 160, 161--- Manzanita	Blue Oak-Annual Grass-Clayey Terrace (14).	Favorable	3,000	Soft chess	20
		Normal	2,800	Needlegrass	10
		Unfavorable	1,500	Whitestem filaree	10
				Blue oak	5
				California brome	5
				Manzanita	5
				Red brome	5
				Bluegrass	5
				Wild oat	5
				Foxtail fescue	5
				Bottlebrush squirreltail	5
				Blue wildrye	5
				Spanish clover	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
162, 163---------- Manzanita	Blue Oak-Annual Grass-Clayey Terrace (14).	Favorable Normal Unfavorable	2,800 2,500 1,100	Slender oat---------- Soft chess---------- Clover---------- Whitestem filaree---------- Blue oak---------- California brome---------- Manzanita---------- Needlegrass---------- Red brome---------- Ripgut brome---------- Foxtail fescue---------- Bottlebrush squirreltail------	15 15 10 10 5 5 5 5 5 5 5 5
164, 165---------- Maxwell	Annual Grass-Clayey Serpentine (14).	Favorable Normal Unfavorable	2,100 1,500 800	Slender oat---------- Soft chess---------- Wild oat---------- Mouse barley---------- Foxtail fescue---------- Filaree---------- Clover----------	30 30 10 10 5 5 5
175*: Maymen.					
Millsholm---------	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable Normal Unfavorable	1,800 1,400 1,000	Soft chess---------- Filaree---------- Manzanita---------- Wild oat---------- Ripgut brome---------- Blue oak---------- Blue wildrye---------- Clover----------	15 15 15 10 10 10 5 5
Bressa----------	Blue Oak-Annual Grass-Loamy (15).	Favorable Normal Unfavorable	3,600 2,600 1,400	Soft chess---------- Wild oat---------- Blue wildrye---------- California brome---------- Ripgut brome---------- Red brome---------- Filaree----------	20 20 15 5 5 5 5
177*: Millsholm---------	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable Normal Unfavorable	1,800 1,400 1,000	Soft chess---------- Filaree---------- Manzanita---------- Wild oat---------- Ripgut brome---------- Blue oak---------- Blue wildrye---------- Clover----------	15 15 15 10 10 10 5 5
Bressa----------	Blue Oak-Annual Grass-Loamy (15).	Favorable Normal Unfavorable	3,600 2,600 1,400	Soft chess---------- Wild oat---------- Blue wildrye---------- California brome---------- Ripgut brome---------- Red brome---------- Filaree----------	20 20 15 5 5 5 5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
178*:					
Millsholm	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable	1,800	Soft chess	15
		Normal	1,400	Filaree	15
		Unfavorable	1,000	Manzanita	15
				Wild oat	10
				Ripgut brome	10
				Blue oak	10
				Blue wildrye	5
				Clover	5
Bressa	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,600	Soft chess	20
		Normal	2,600	Wild oat	20
		Unfavorable	1,400	Blue wildrye	15
				California brome	5
				Ripgut brome	5
				Red brome	5
				Filaree	5
Hopland.					
179*:					
Millsholm	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable	1,800	Soft chess	15
		Normal	1,400	Filaree	15
		Unfavorable	1,000	Manzanita	15
				Wild oat	10
				Ripgut brome	10
				Blue oak	10
				Blue wildrye	5
				Clover	5
Squawrock	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,600	Wild oat	20
		Normal	2,200	Soft chess	20
		Unfavorable	1,400	Broadleaf filaree	10
				Foxtail fescue	5
				Purple needlegrass	5
				Burclover	5
Pomo	Annual Grass-Clayey Unstable (15).	Favorable	2,800	Soft chess	20
		Normal	2,200	Purple needlegrass	20
		Unfavorable	1,600	Filaree	10
				Burclover	10
				Wild oat	10
				Foxtail fescue	5
180 Mocho Variant	Annual Grass-Loamy Bottomland (14).	Favorable	3,800	Soft chess	35
		Normal	3,400	Wild oat	10
		Unfavorable	1,800	Clover	10
				Whitestem filaree	5
				Ripgut brome	5
				Red brome	5
				Burclover	5
				Ryegrass	5
				California white oak	5
181*:					
Neice	Blue Oak-Annual Grass-Claypan (15).	Favorable	2,000	Slender oat	25
		Normal	1,500	Soft chess	20
		Unfavorable	800	Whitestem filaree	10
				Chamise	10
				Wild oat	5
				Buckbrush	5
				Bottlebrush squirreltail	5
				Clover	5
				Manzanita	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
181*:					
Sobrante	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oat	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
Hambright	Live Oak-Manzanita-Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5
182*:					
Neice	Blue Oak-Annual Grass-Claypan (15).	Favorable	2,000	Slender oat	25
		Normal	1,500	Soft chess	20
		Unfavorable	800	Whitestem filaree	10
				Chamise	10
				Wild oat	5
				Buckbrush	5
				Bottlebrush squirreltail	5
				Clover	5
				Manzanita	5
Sobrante	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oat	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
Hambright	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
194---------- Oxalis Variant	Annual Grass-Claypan (14)-----	Favorable	2,500	Soft chess----------	40
		Normal	2,100	Red brome----------	5
		Unfavorable	1,500	Foxtail fescue----------	5
				Burclover----------	5
				Filaree----------	5
				Wild oat----------	5
195*, 196*, 197*: Phipps clay loam--	Blue Oak-Annual Grass-Clayey (15).	Favorable	3,200	Wild oat----------	30
		Normal	2,500	Soft chess----------	30
		Unfavorable	1,500	Filaree----------	10
				Foxtail fescue----------	5
				Blue oak----------	5
Phipps loam.					
198*: Pomo----------	Annual Grass-Clayey Unstable (15).	Favorable	2,800	Soft chess----------	20
		Normal	2,200	Purple needlegrass----------	20
		Unfavorable	1,600	Filaree----------	10
				Burclover----------	10
				Wild oat----------	10
				Foxtail fescue----------	5
Bressa----------	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,600	Soft chess----------	20
		Normal	2,600	Wild oat----------	20
		Unfavorable	1,400	Blue wildrye----------	15
				California brome----------	5
				Ripgut brome----------	5
				Red brome----------	5
				Filaree----------	5
206*: Shortyork Variant-	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,500	Soft chess----------	40
		Normal	1,800	Wild oat----------	15
		Unfavorable	1,100	Clover----------	10
				Ripgut brome----------	5
				Lotus----------	5
				Filaree----------	5
Yorkville----------	Annual Grass-Clayey Unstable (15).	Favorable	3,300	Wild oat----------	30
		Normal	2,800	Burclover----------	10
		Unfavorable	1,200	Soft chess----------	5
				Purple needlegrass----------	5
				Barley----------	5
				Foxtail fescue----------	5
				Dogtail----------	5
				Filaree----------	5
Squawrock----------	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,600	Wild oat----------	20
		Normal	2,200	Soft chess----------	20
		Unfavorable	1,400	Broadleaf filaree----------	10
				Foxtail fescue----------	5
				Purple needlegrass----------	5
				Burclover----------	5
207*, 208*: Skyhigh----------	Blue Oak-Annual Grass-Clayey (15).	Favorable	4,200	Soft chess----------	25
		Normal	3,300	Blue oak----------	10
		Unfavorable	2,000	Burclover----------	10
				Wild oat----------	10
				Purple needlegrass----------	10
				Filaree----------	10
				Clover----------	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
207*, 208*:					
Asbill	Annual Grass-Claypan (15)	Favorable	2,500	Wild oat	30
		Normal	1,800	Soft chess	30
		Unfavorable	1,100	Ripgut brome	10
				Foxtail fescue	5
				Blue oak	5
209*:					
Skyhigh	Blue Oak-Annual Grass-Clayey (15).	Favorable	4,200	Soft chess	25
		Normal	3,300	Blue oak	10
		Unfavorable	2,000	Burclover	10
				Wild oat	10
				Purple needlegrass	10
				Filaree	10
				Clover	5
Millsholm	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable	1,800	Soft chess	15
		Normal	1,400	Filaree	15
		Unfavorable	1,000	Manzanita	15
				Wild oat	10
				Ripgut brome	10
				Blue oak	10
				Blue wildrye	5
				Clover	5
210*, 211*, 212*:					
Skyhigh	Blue Oak-Annual Grass-Clayey (15).	Favorable	4,200	Soft chess	25
		Normal	3,300	Blue oak	10
		Unfavorable	2,000	Burclover	10
				Wild oat	10
				Purple needlegrass	10
				Filaree	10
				Clover	5
Sleeper	Annual Grass-Clayey Unstable (15).	Favorable	3,200	Soft chess	30
		Normal	3,000	Wild oat	15
		Unfavorable	1,800	Ripgut brome	10
				Filaree	10
				Needlegrass	10
				Blue oak	5
				Bluegrass	5
				Foxtail fescue	5
Millsholm	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable	1,800	Soft chess	15
		Normal	1,400	Filaree	15
		Unfavorable	1,000	Manzanita	15
				Wild oat	10
				Ripgut brome	10
				Blue oak	10
				Blue wildrye	5
				Clover	5
213*, 214*, 215*:					
Sleeper Variant	Annual Grass-Clayey Unstable (15).	Favorable	3,000	Soft chess	30
		Normal	2,500	Wild oat	15
		Unfavorable	2,000	Ripgut brome	10
				Filaree	10
				Needlegrass	10
				Blue oak	10
				Foxtail fescue	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
213*, 214*, 215*:					
Sleeper	Annual Grass-Clayey Unstable (15).	Favorable	3,200	Soft chess	30
		Normal	3,000	Wild oat	15
		Unfavorable	1,800	Ripgut brome	10
				Filaree	10
				Needlegrass	10
				Blue oak	5
				Bluegrass	5
				Foxtail fescue	5
216*, 217*:					
Sobrante	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oat	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
Collayomi.					
Whispering.					
218*, 219*:					
Sobrante	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oat	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
Guenoc	Blue Oak-Annual Grass-Clayey (15).	Favorable	2,500	Manzanita	30
		Normal	2,000	Ceanothus	20
		Unfavorable	1,000	Soft chess	10
				Wild oat	10
				Needlegrass	5
				Blue wildrye	5
				Filaree	5
				Clover	5
				Toyon	5
Hambright	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
220*:					
Sobrante	Blue Oak-Annual Grass-Loamy (15).	Favorable	3,500	Soft chess	25
		Normal	2,400	Wild oat	10
		Unfavorable	1,200	Ripgut brome	10
				Burclover	10
				Foxtail fescue	5
				Mouse barley	5
				Nitgrass	5
				Clover	5
				Filaree	5
				Blue oak	5
				Interior live oak	5
Hambright	Live Oak-Manzanita-Very Gravelly Loamy (15).	Favorable	1,600	Soft chess	15
		Normal	1,000	Filaree	15
		Unfavorable	600	Whiteleaf manzanita	10
				Chamise	10
				Ceanothus	10
				California scrub oak	10
				Red brome	5
				Ripgut brome	5
				Clover	5
				California yerba-santa	5
				Blue oak	5
Guenoc	Blue Oak-Annual Grass-Clayey (15).	Favorable	2,500	Manzanita	30
		Normal	2,000	Ceanothus	20
		Unfavorable	1,000	Soft chess	10
				Wild oat	10
				Needlegrass	5
				Blue wildrye	5
				Filaree	5
				Clover	5
				Toyon	5
227*:					
Speaker.					
Maymen.					
Millsholm	Blue Oak-Annual Grass-Shallow Loamy (15).	Favorable	1,800	Soft chess	15
		Normal	1,400	Filaree	15
		Unfavorable	1,000	Manzanita	15
				Wild oat	10
				Ripgut brome	10
				Blue oak	10
				Blue wildrye	5
				Clover	5
231*:					
Squawrock	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,600	Wild oat	20
		Normal	2,200	Soft chess	20
		Unfavorable	1,400	Broadleaf filaree	10
				Foxtail fescue	5
				Purple needlegrass	5
				Burclover	5
Shortyork Variant	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,500	Soft chess	40
		Normal	1,800	Wild oat	15
		Unfavorable	1,100	Clover	10
				Ripgut brome	5
				Lotus	5
				Filaree	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
235*:					
Still	Annual Grass-Loamy Bottomland (14).	Favorable	4,000	Wild oat	20
		Normal	3,500	Filaree	15
		Unfavorable	2,500	Fescue	10
				Burclover	10
				Purple needlegrass	10
				Red brome	10
				Clover	5
				California live oak	5
				Italian ryegrass	5
Talmage	Annual Grass-Very Gravelly Loamy (14).	Favorable	1,200	Soft chess	20
		Normal	800	Filaree	20
		Unfavorable	400	Wild oat	5
				Silver hairgrass	5
				Ripgut brome	5
				Dogtail	5
				Prairie threeawn	5
				Medusahead	5
				Turkeymullein	5
				Red brome	5
				Foxtail fescue	5
				Annual lupine	5
237--- Talmage	Annual Grass-Very Gravelly Loamy (14).	Favorable	1,200	Soft chess	20
		Normal	800	Filaree	20
		Unfavorable	400	Wild oat	5
				Silver hairgrass	5
				Ripgut brome	5
				Dogtail	5
				Prairie threeawn	5
				Medusahead	5
				Turkeymullein	5
				Red brome	5
				Foxtail fescue	5
				Annual lupine	5
242, 243--- Wappo	Annual Grass-Claypan (14)---	Favorable	2,400	Soft chess	25
		Normal	1,600	Wild oat	15
		Unfavorable	1,000	Filaree	10
				Ripgut brome	10
				Red brome	10
				Foxtail fescue	5
				Burclover	5
				Clover	5
				Mouse barley	5
244--- Wappo Variant	Annual Grass-Claypan (14)---	Favorable	2,500	Wild oat	20
		Normal	2,000	Soft chess	20
		Unfavorable	1,600	Foxtail fescue	5
				Big squirreltail	5
				Ripgut brome	5
				Burclover	5
				Filaree	5
246, 247--- Wolfcreek	Annual Grass-Loamy Bottomland (14).	Favorable	3,500	Soft chess	30
		Normal	2,800	Filaree	15
		Unfavorable	1,000	Burclover	15
				Lotus	10
				Foxtail fescue	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
252*:					
Yorktree----------	Mixed Oak-Blue Wildrye-Clayey (5).	Favorable	2,800	Melic----------	15
		Normal	2,400	Blue wildrye----------	10
		Unfavorable	1,800	Sheep fescue----------	10
				Soap plant----------	10
				Buttercup----------	10
				Bluegrass----------	5
				Clover----------	5
				California black oak----------	5
				Dogtail----------	5
				Iris----------	5
Hopland.					
Squawrock----------	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,600	Wild oat----------	20
		Normal	2,200	Soft chess----------	20
		Unfavorable	1,400	Broadleaf filaree----------	10
				Foxtail fescue----------	5
				Purple needlegrass----------	5
				Burclover----------	5
253*:					
Yorkville----------	Annual Grass-Clayey Unstable (15).	Favorable	3,300	Wild oat----------	30
		Normal	2,800	Burclover----------	10
		Unfavorable	1,200	Soft chess----------	5
				Purple needlegrass----------	5
				Barley----------	5
				Foxtail fescue----------	5
				Dogtail----------	5
				Filaree----------	5
Pomo----------	Annual Grass-Loamy Unstable (15).	Favorable	2,800	Soft chess----------	20
		Normal	2,200	Purple needlegrass----------	20
		Unfavorable	1,600	Filaree----------	10
				Burclover----------	10
				Wild oat----------	10
				Foxtail fescue----------	5
254*:					
Yorkville----------	Annual Grass-Clayey Unstable (15).	Favorable	3,300	Wild oat----------	30
		Normal	2,800	Burclover----------	10
		Unfavorable	1,200	Soft chess----------	5
				Purple needlegrass----------	5
				Barley----------	5
				Foxtail fescue----------	5
				Dogtail----------	5
				Filaree----------	5
Yorktree----------	Mixed Oak-Blue Wild Rye-Clayey (5).	Favorable	2,800	Melic----------	15
		Normal	2,400	Blue wildrye----------	10
		Unfavorable	1,800	Sheep fescue----------	10
				Soap plant----------	10
				Buttercup----------	10
				Bluegrass----------	5
				Clover----------	5
				California black oak----------	5
				Dogtail----------	5
				Iris----------	5

See footnote at end of table.

TABLE 8.--RANGELAND PRODUCTIVITY AND CHARACTERISTIC PLANT COMMUNITIES--Continued

Soil name and map symbol	Range site	Total production		Characteristic vegetation	Composition
		Kind of year	Dry weight		
			Lb/acre		Pct
254*:					
Squawrock	Annual Grass-Very Gravelly Loamy (15).	Favorable	2,600	Wild oat	20
		Normal	2,200	Soft chess	20
		Unfavorable	1,400	Broadleaf filaree	10
				Foxtail fescue	5
				Purple needlegrass	5
				Burclover	5
255 Yorkville Variant	Annual Grass-Clayey Serpentine (14).	Favorable	2,000	Soft chess	30
		Normal	1,500	Bottlebrush squirreltail	20
		Unfavorable	1,250	Danthonia	20
				Needlegrass	5
				Manzanita	5

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY

[See text for definitions of "slight", "moderate", and "severe". Only the soils suitable for production of commercial trees are listed, except for those that are included in map units that have such soils. Absence of an entry indicates that adequate information was not available]

Soil name and map symbol	Ordination symbol	Potential productivity			Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from--		Hazard of sheet and rill erosion when yarded by--	
		Commonly grown trees	Site index[1]	Confidence limit (95%)[2]				Fire	Compaction	Tractor	Skyline
101, 102:											
Aiken------	10A	Ponderosa pine--	117	8	Slight	Slight	Moderate	Slight	Severe	Slight	Slight.
		California black oak----------	---	---							
Sobrante---	1A	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Interior live oak----------	---	---							
109:											
Bamtush----	13F	Ponderosa pine--	139	9	Slight	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	134	16							
Neuns------	8F	Ponderosa pine--	106	15	Slight	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	113	---							
110:											
Bamtush----	13R	Ponderosa pine--	139	9	Moderate	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	134	16							
Speaker----	8R	Ponderosa pine--	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	107	12							
Sanhedrin--	9R	Ponderosa pine--	116	7	Moderate	Slight	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
111:											
Bamtush----	13R	Ponderosa pine--	139	9	Severe	Moderate	Moderate	Moderate	Slight	Moderate	Slight.
		Douglas-fir-----	134	16							
Speaker----	8R	Ponderosa pine--	106	25	Severe	Moderate	Moderate	Slight	Moderate	Severe	Slight.
		Douglas-fir-----	107	12							
Sanhedrin--	9R	Ponderosa pine--	116	7	Severe	Slight	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	121	7							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity			Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from--		Hazard of sheet and rill erosion when yarded by--	
		Commonly grown trees	Site index[1]	Confidence limit (95%)[2]				Fire	Compaction	Tractor	Skyline
117:											
Bottlerock-	8F	Ponderosa pine--	103	---	Slight	Severe	Moderate	Severe	Slight	Slight	Slight.
		Canyon live oak-	---	---							
Glenview---	8F	Ponderosa pine--	110	---	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Canyon live oak-	---	---							
Arrowhead.											
118:											
Bottlerock-	8R	Ponderosa pine--	103	---	Moderate	Severe	Moderate	Severe	Slight	Slight	Slight.
		Canyon live oak-	---	---							
Glenview---	8R	Ponderosa pine--	110	---	Moderate	Moderate	Moderate	Moderate	Moderate	Slight	Slight.
Arrowhead.											
119, 120:											
Bressa-----	1A	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
Millsholm--	1D	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Digger pine-----	---	---							
126:											
Collayomi very gravelly loam------	10R	Ponderosa pine--	122	12	Severe	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	110	---							
Collayomi stony loam------	10R	Ponderosa pine--	122	12	Severe	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	110	---							
127:											
Collayomi--	10F	Ponderosa pine--	122	12	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	110	---							
Aiken------	13A	Ponderosa pine--	137	---	Slight	Slight	Moderate	Slight	Severe	Slight	Slight.
		Douglas-fir-----	134	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity			Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from--		Hazard of sheet and rill erosion when yarded by--	
		Commonly grown trees	Site index[1]	Confidence limit (95%)[2]				Fire	Compaction	Tractor	Skyline
127:											
Whispering-	8F	Ponderosa pine--	109	---	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	107	---							
128:											
Collayomi--	10R	Ponderosa pine--	122	12	Moderate	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	110	---							
Aiken------	13R	Ponderosa pine--	137	---	Moderate	Slight	Moderate	Slight	Severe	Moderate	Slight.
		Douglas-fir-----	134	---							
Whispering-	8R	Ponderosa pine--	109	---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Sugar pine------	---	---							
		California black oak------	---	---							
		Douglas-fir-----	107	---							
129:											
Collayomi--	10R	Ponderosa pine--	122	12	Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	110	---							
Whispering-	8R	Ponderosa pine--	109	---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Sugar pine------	---	---							
		California black oak------	---	---							
		Douglas-fir-----	107	---							
130:											
Deadwood---	5R	Ponderosa pine--	84	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		Canyon live oak-	---	---							
		Incense-cedar---	---	---							
		Sugar pine------	---	---							
		Douglas-fir-----	83	---							
Sheetiron--	8R	Ponderosa pine--	105	---	Severe	Moderate	Moderate	Slight	Slight	Severe	Slight.
		Douglas-fir-----	105	---							
132, 133----											
Forbesville	2C	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Severe	Slight	Slight.

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
134: Forward Variant--- Kidd.	10R	Douglas-fir-----	127	---	Moderate	Moderate	Severe	Slight	Slight	Slight	Slight.
		Ponderosa pine--	123	---							
135: Forward Variant--- Kidd.	10R	Douglas-fir-----	127	---	Severe	Moderate	Severe	Slight	Slight	Moderate	Slight.
		Ponderosa pine--	123	---							
136: Freezeout--	7R	White fir-------	53	---	Moderate	Moderate	Slight	Slight	Moderate	Slight	Slight.
		Red fir---------	---	---							
		Jeffrey pine----	---	---							
		Sugar pine------	---	---							
Yollabolly-	4R	White fir-------	---	---	Moderate	Severe	Slight	Moderate	Slight	Moderate	Slight.
		Ponderosa pine--	---	---							
		Jeffrey pine----	---	---							
		Red fir---------	---	---							
137: Freezeout--	7R	White fir-------	53	---	Severe	Moderate	Slight	Moderate	Moderate	Moderate	Slight.
		Red fir---------	---	---							
		Jeffrey pine----	---	---							
		Sugar pine------	---	---							
Yollabolly-	4R	White fir-------	---	---	Severe	Severe	Slight	Moderate	Slight	Severe	Moderate.
		Ponderosa pine--	---	---							
		Red fir---------	---	---							
		Jeffrey pine----	---	---							
138, 139: Glenview--- Arrowhead.	8F	Ponderosa pine--	110	---	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Canyon live oak-	---	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
140:											
Glenview---	8A	Ponderosa pine--	110	---	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
Bottlerock-	8F	Ponderosa pine--	103	---	Slight	Severe	Moderate	Severe	Slight	Slight	Slight.
		Canyon live oak-	---	---							
144, 145----	10A	Douglas-fir-----	122	13	Slight	Slight	Moderate	Slight	Moderate	Slight	Slight.
Jafa		Ponderosa pine--	118	14							
146:											
Jafa loam--	10A	Douglas-fir-----	122	13	Slight	Slight	Moderate	Slight	Moderate	Slight	Slight.
		Ponderosa pine--	118	14							
Jafa gravelly loam------	10A	Douglas-fir-----	122	13	Slight	Slight	Moderate	Slight	Moderate	Slight	Slight.
		Ponderosa pine--	118	14							
148, 149:											
Kidd.											
Forward----	7R	Ponderosa pine--	97	---	Moderate	Moderate	Severe	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	102	---							
152, 153:											
Konocti----	1F	Blue oak--------	---	---	Slight	Severe	Moderate	Moderate	Slight	Slight	Slight.
		Interior live oak----------	---	---							
Hambright--	1F	Blue oak--------	---	---	Slight	Severe	Severe	Moderate	Slight	Slight	Slight.
154:											
Konocti----	1R	Blue oak--------	---	---	Severe	Severe	Moderate	Severe	Slight	Severe	Moderate.
		Interior live oak----------	---	---							
Hambright--	1R	Blue oak--------	---	---	Severe	Severe	Severe	Moderate	Slight	Severe	Slight.
Rock outcrop.											

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
155, 156: Konocti Variant---	3F	Interior live oak----------	---	---	Slight	Severe	Moderate	Moderate	Slight	Slight	Slight.
		Blue oak--------	---	---							
		Knobcone pine---	---	---							
Konocti----	1F	Blue oak--------	---	---	Slight	Severe	Moderate	Moderate	Slight	Slight	Slight.
		Interior live oak----------	---	---							
Hambright--	1F	Blue oak--------	---	---	Slight	Severe	Moderate	Moderate	Slight	Slight	Slight.
159, 160, 161, 162, 163-------- Manzanita	2A	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Severe	Slight	Slight.
166: Maymen.											
Etsel.											
Mayacama---	4F	Douglas-fir-----	80	---	Slight	Severe	Slight	Moderate	Slight	Slight	Slight.
		California black oak------	35	---							
		Canyon live oak-	---	---							
167: Maymen.											
Etsel.											
Mayacama---	4R	Douglas-fir-----	80	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		California black oak------	35	---							
		Canyon live oak-	---								
170: Maymen.											

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
170: Etsel.											
Speaker----	8R	Ponderosa pine-- Douglas-fir-----	106 107	25 12	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
171: Maymen.											
Hopland----	4R	California black oak------ Madrone---------	44 ---	5 ---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
Etsel.											
172: Maymen.											
Hopland----	4R	California black oak------ Interior live oak---------- Madrone---------	44 --- ---	5 --- ---	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
Mayacama---	4F	Douglas-fir----- California black oak------ Canyon live oak-	80 35 ---	--- --- ---	Slight	Severe	Slight	Moderate	Slight	Slight	Slight.
173: Maymen.											
Hopland----	4R	California black oak------ Madrone--------- Interior live oak----------	44 --- ---	5 --- ---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
173:											
Mayacama---	4F	Douglas-fir-----	80	---	Moderate	Severe	Slight	Moderate	Slight	Moderate	Slight.
		California black oak------	35	---							
		Canyon live oak-	---	---							
174:											
Maymen.											
Hopland----	4R	California black oak------	44	5	Severe	Moderate	Moderate	Slight	Moderate	Severe	Slight.
		Madrone---------	---	---							
		Interior live oak----------	---	---							
Mayacama---	4F	Douglas-fir-----	80	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		California black oak------	35	---							
		Canyon live oak-	---	---							
175:											
Maymen.											
Millsholm--	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
Bressa-----	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
177:											
Millsholm--	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
Bressa-----	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
178:											
Millsholm--	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
Bressa-----	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
178:											
Hopland----	4R	California black oak------	44	5	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Madrone---------	---	---							
181:											
Neice------	2C	Blue oak--------	---	---	Slight	Severe	Moderate	Slight	Moderate	Slight	Slight.
		California white oak------	---	---							
		Buckeye California-laurel---------	---	---							
Sobrante---	1A	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Interior live oak----------	---	---							
Hambright--	1F	Blue oak--------	---	---	Slight	Severe	Severe	Moderate	Slight	Slight	Slight.
182:											
Neice------	2R	Blue oak--------	---	---	Severe	Severe	Moderate	Slight	Moderate	Moderate	Slight.
		California white oak------	---	---							
		Buckeye California-laurel---------	---	---							
Sobrante---	1R	Blue oak--------	---	---	Severe	Severe	Severe	Slight	Moderate	Severe	Slight.
		Interior live oak----------	---	---							
Hambright--	1R	Blue oak--------	---	---	Slight	Severe	Severe	Moderate	Slight	Slight	Slight.
183:											
Neuns------	8R	Ponderosa pine--	106	15	Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	113	---							
Bamtush----	13R	Ponderosa pine--	139	9	Moderate	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	134	16							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity			Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from--		Hazard of sheet and rill erosion when yarded by--	
		Commonly grown trees	Site index[1]	Confidence limit (95%)[2]				Fire	Compaction	Tractor	Skyline
183:											
Deadwood---	5R	Ponderosa pine--	84	---	Moderate	Severe	Slight	Moderate	Slight	Moderate	Slight.
		Canyon live oak-	---	---							
		Douglas-fir-----	83	---							
184:											
Neuns------	8R	Ponderosa pine--	106	15	Severe	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	113	---							
Deadwood---	5R	Ponderosa pine--	84	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		Canyon live oak-	---	---							
		Douglas-fir-----	83	---							
Bamtush----	13R	Ponderosa pine--	139	9	Severe	Moderate	Moderate	Moderate	Slight	Moderate	Slight.
		Douglas-fir-----	134	16							
185:											
Neuns------	8R	Ponderosa pine--	106	15	Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	113	---							
Decy-------	8R	Ponderosa pine--	106	---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	101	---							
Sanhedrin--	10R	Ponderosa pine--	116	7	Moderate	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
186:											
Neuns------	8R	Ponderosa pine--	106	15	Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight.
Sanhedrin--	9R	Ponderosa pine--	116	7	Moderate	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
Deadwood---	5R	Ponderosa pine--	84	---	Moderate	Severe	Slight	Moderate	Slight	Moderate	Slight.
		Canyon live oak-	---	---							
		Douglas-fir-----	83	---							
187:											
Neuns------	8R	Ponderosa pine--	106	15	Severe	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	113	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
187:											
Sanhedrin--	9R	Ponderosa pine--	116	7	Severe	Slight	Severe	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	121	7							
Deadwood---	5R	Ponderosa pine--	84	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		Canyon live oak-	---	---							
		Douglas-fir-----	83	---							
188:											
Neuns------	8R	Ponderosa pine--	106	15	Moderate	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	113	---							
Sanhedrin--	9R	Ponderosa pine--	116	7	Moderate	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
Speaker----	8R	Ponderosa pine--	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	107	12							
189:											
Neuns------	8R	Ponderosa pine--	106	15	Severe	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	113	---							
Sheetiron--	8R	Ponderosa pine--	105	---	Severe	Moderate	Moderate	Slight	Slight	Severe	Slight.
		Douglas-fir-----	105	---							
Deadwood---	5R	Ponderosa pine--	84	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		Canyon live oak-	---	---							
		Douglas-fir-----	83	---							
191:											
Neuns------	8F	Ponderosa pine--	106	15	Slight	Moderate	Moderate	Slight	Slight	Slight	Slight.
		Douglas-fir-----	113	---							
Speaker----	8A	Ponderosa pine--	106	25	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	107	12							
195, 196:											
Phipps clay loam------	1C	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity			Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from--		Hazard of sheet and rill erosion when yarded by--	
		Commonly grown trees	Site index[1]	Confidence limit (95%)[2]				Fire	Compaction	Tractor	Skyline
195, 196: Phipps loam------	1C	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
197: Phipps clay loam------	1C	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Slight.
Phipps loam------	1C	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Slight.
198: Pomo.											
Bressa-----	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
201: Sanhedrin--	9A	Ponderosa pine--	116	7	Slight	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
Kekawaka[3]--	14A	Ponderosa pine--	147	---	Slight	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	154	8							
Speaker----	8A	Ponderosa pine--	106	25	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	107	12							
202: Sanhedrin--	9A	Ponderosa pine--	116	7	Moderate	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
Kekawaka[3]--	14R	Ponderosa pine--	147	---	Moderate	Slight	Severe	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	154	8							
Speaker----	8R	Ponderosa pine--	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	107	12							
204: Sheetiron--	8R	Ponderosa pine--	105	---	Moderate	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Douglas-fir-----	105	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
204:											
Deadwood---	5R	Ponderosa pine--	84	---	Moderate	Severe	Slight	Moderate	Slight	Moderate	Slight.
		Canyon live oak-	---	---							
		Incense-cedar---	---	---							
		Sugar pine------	---	---							
		Douglas-fir-----	83	---							
205:											
Sheetiron--	8R	Ponderosa pine--	105	---	Severe	Moderate	Moderate	Slight	Slight	Severe	Slight.
		Douglas-fir-----	105	---							
Deadwood---	5R	Ponderosa pine--	84	---	Severe	Severe	Slight	Moderate	Slight	Severe	Slight.
		Canyon live oak-	---	---							
		Incense-cedar---	---	---							
		Sugar pine------	---	---							
		Douglas-fir-----	83	---							
207:											
Skyhigh----	3C	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Digger pine-----	---	---							
Asbill.											
208:											
Skyhigh----	3R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
Asbill.											
209:											
Skyhigh----	3R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
Millsholm--	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
210, 211:											
Skyhigh----	3C	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Digger pine-----	---	---							
Sleeper.											

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
210, 211:											
Millsholm--	1D	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Digger pine-----	---	---							
212:											
Skyhigh----	3R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
		Digger pine-----	---	---							
Sleeper.											
Millsholm--	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
216:											
Sobrante---	1A	Blue oak--------	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Interior live oak----------	---	---							
Collayomi--	10F	Ponderosa pine--	122	12	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		California black oak------	---	---							
		Madrone---------	---	---							
Whispering-	8F	Ponderosa pine--	109	---	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		California black oak------	---	---							
		Madrone---------	---	---							
		Douglas-fir-----	107	---							
217:											
Sobrante---	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
		Interior live oak----------	---	---							
Collayomi--	10R	Ponderosa pine--	122	12	Moderate	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		California black oak------	---	---							
		Madrone---------	---	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
217:											
Whispering-	8R	Ponderosa pine	109	---	Moderate	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		California black oak	---	---							
		Madrone	---	---							
		Douglas-fir	107	---							
218, 219:											
Sobrante---	1A	Blue oak	---	---	Slight	Severe	Severe	Slight	Moderate	Slight	Slight.
		Interior live oak	---	---							
Guenoc-----	1C	Blue oak	---	---	Moderate	Severe	Severe	Slight	Moderate	Slight	Slight.
		Interior live oak	---	---							
		Digger pine	---	---							
Hambright--	1F	Blue oak	---	---	Slight	Severe	Severe	Moderate	Slight	Slight	Slight.
220:											
Sobrante---	1R	Blue oak	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
		Interior live oak	---	---							
Hambright--	1R	Blue oak	---	---	Moderate	Severe	Severe	Moderate	Slight	Moderate	Slight.
Guenoc-----	1R	Blue oak	---	---	Moderate	Severe	Severe	Slight	Moderate	Moderate	Slight.
		Interior live oak	---	---							
		Digger pine	---	---							
224:											
Speaker----	8R	Ponderosa pine	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir	107	12							
Marpa------	8R	Ponderosa pine	105	---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		California black oak	---	---							
		Interior live oak	---	---							
		Douglas-fir	---	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
224:											
Sanhedrin--	9R	Ponderosa pine--	116	7	Moderate	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
225:											
Speaker----	8R	Ponderosa pine--	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	107	12							
Maymen.											
Marpa------	8R	Ponderosa pine--	105	---	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	103	---							
226:											
Speaker----	8R	Ponderosa pine--	106	25	Severe	Moderate	Moderate	Slight	Moderate	Severe	Slight.
		Douglas-fir-----	107	12							
Maymen.											
Marpa------	8R	Ponderosa pine--	105	---	Severe	Moderate	Moderate	Slight	Moderate	Severe	Slight.
		Douglas-fir-----	103	---							
227:											
Speaker----	8R	Ponderosa pine--	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	107	12							
Maymen.											
Millsholm--	1R	Blue oak--------	---	---	Moderate	Severe	Severe	Slight	Moderate	Severe	Moderate.
		Digger pine-----	---	---							
228:											
Speaker----	8R	Ponderosa pine--	106	25	Severe	Moderate	Moderate	Slight	Moderate	Severe	Slight.
		Douglas-fir-----	107	12							
Sanhedrin--	9R	Ponderosa pine--	116	7	Severe	Slight	Severe	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	121	7							
229:											
Speaker----	8R	Ponderosa pine--	106	25	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	107	12							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
229:											
Sanhedrin--	9R	Ponderosa pine--	116	7	Moderate	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
Maymen.											
230:											
Speaker----	8A	Ponderosa pine--	106	25	Slight	Moderate	Moderate	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	107	12							
Speaker Variant---	5A	Ponderosa pine--	80	---	Slight	Moderate	Slight	Slight	Moderate	Slight	Slight.
Sanhedrin--	9A	Ponderosa pine--	116	7	Slight	Slight	Severe	Slight	Moderate	Slight	Slight.
		Douglas-fir-----	121	7							
240:											
Tyson------	2R	Oregon white oak----------	---	---	Severe	Severe	Slight	Slight	Moderate	Severe	Slight.
Neuns------	8R	Ponderosa pine--	106	15	Severe	Moderate	Moderate	Slight	Slight	Moderate	Slight.
		Oregon white oak----------	---	---							
		Douglas-fir-----	113	---							
245:											
Whispering-	8R	Ponderosa pine--	109	---	Severe	Moderate	Moderate	Slight	Moderate	Severe	Slight.
		Sugar pine------	---	---							
		California black oak------	---	---							
		Douglas-fir-----	107	---							
Collayomi very gravelly loam------	10R	Ponderosa pine--	122	12	Severe	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	110	---							
Collayomi stony loam------	10R	Ponderosa pine--	122	12	Severe	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Douglas-fir-----	110	---							

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity: Commonly grown trees	Potential productivity: Site index[1]	Potential productivity: Confidence limit (95%)[2]	Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from: Fire	Hazard of damage from: Compaction	Hazard of sheet and rill erosion when yarded by: Tractor	Hazard of sheet and rill erosion when yarded by: Skyline
250:											
Yollabolly-	4R	White fir	53	---	Moderate	Severe	Slight	Moderate	Slight	Moderate	Slight.
		Jeffrey pine	---	---							
		Sugar pine	---	---							
		Incense-cedar	---	---							
		Douglas-fir	---	---							
Freezeout--	7R	White fir	53	---	Moderate	Moderate	Slight	Moderate	Moderate	Slight	Slight.
		Red fir	---	---							
		Jeffrey pine	---	---							
		Sugar pine	---	---							
		Incense-cedar	---	---							
		Douglas-fir	---	---							
251:											
Yollabolly-	4R	White fir	53	---	Severe	Severe	Slight	Moderate	Slight	Severe	Moderate.
		Jeffrey pine	---	---							
		Ponderosa pine	---	---							
		Red fir	---	---							
Rock outcrop.											
Freezeout--	7R	White fir	53	---	Severe	Moderate	Slight	Moderate	Moderate	Moderate	Slight.
		Red fir	---	---							
		Jeffrey pine	---	---							
		Sugar pine	---	---							
		Incense-cedar	---	---							
		Douglas-fir	---	---							
252:											
Yorktree---	2R	Oregon white oak	---	---	Severe	Moderate	Severe	Slight	Moderate	Moderate	Slight.
		California black oak	25	---							
Hopland----	4R	California black oak	44	5	Moderate	Moderate	Moderate	Slight	Moderate	Moderate	Slight.
		Madrone	---	---							
Squawrock.											

See footnotes at end of table.

TABLE 9.--WOODLAND MANAGEMENT AND PRODUCTIVITY--Continued

Soil name and map symbol	Ordination symbol	Potential productivity			Equipment limitations	Seedling mortality	Plant competition	Hazard of damage from--		Hazard of sheet and rill erosion when yarded by--	
		Commonly grown trees	Site index[1]	Confidence limit (95%)[2]				Fire	Compaction	Tractor	Skyline
254: Yorkville.											
Yorktree---	2R	Oregon white oak----------	---	---	Severe	Moderate	Severe	Slight	Moderate	Moderate	Slight
		California black oak------	25	---							
Squawrock.											

[1] See text for explanation of site curves used.
[2] Figures given indicate the plus or minus range.
[3] See description of map unit for explanation of productivity of this soil.

TABLE 10.--RECREATIONAL DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated]

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
101*:					
Aiken	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
Sobrante	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: thin layer, slope.
102*:					
Aiken	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
103 Asbill	Slight	Slight	Severe: slope.	Slight	Moderate: thin layer.
104 Asbill	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
105*. Badland					
106*:					
Bally	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.	Moderate: small stones, droughty.
Phipps	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.	Moderate: small stones.
107*:					
Bally	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Phipps	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
108*:					
Bally	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Phipps	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Haploxeralfs.					

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
109*:					
Bamtush	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
110*, 111*:					
Bamtush	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
112*:					
Benridge	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Konocti cobbly loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: large stones, slope.
Konocti stony loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
113*:					
Benridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Konocti cobbly loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: large stones, slope.
Konocti stony loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
114*:					
Benridge	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
Sodabay	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
115*:					
Benridge	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
115*: Sodabay	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
116--- Benridge Variant	Moderate: slope, percs slowly.	Moderate: slope, percs slowly.	Severe: slope.	Slight	Moderate: droughty, slope, thin layer.
117*: Bottlerock	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, droughty, slope.
Glenview	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
Arrowhead	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
118*: Bottlerock	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Glenview	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
Arrowhead	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, slope.
119*: Bressa	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Millsholm	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: thin layer.
120*: Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, thin layer.
121--- Clear Lake	Severe: flooding.	Moderate: too clayey.	Moderate: too clayey.	Moderate: too clayey.	Severe: too clayey.
122--- Clear Lake Variant	Severe: flooding, too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.	Severe: too clayey.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
123---------- Cole	Severe: flooding.	Slight----------	Slight----------	Slight----------	Slight.
124, 125---------- Cole Variant	Severe: flooding.	Moderate: percs slowly.	Moderate: percs slowly.	Slight----------	Slight.
126*: Collayomi very gravelly loam-------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Collayomi stony loam-	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: large stones, droughty, slope.
127*: Collayomi----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, droughty, slope.
Aiken----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Whispering----------	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
128*: Collayomi----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Aiken----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Whispering----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
129*: Collayomi----------	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Whispering----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
130*: Deadwood----------	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Sheetiron----------	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
131. Fluvaquentic Haplaquolls					
132--- Forbesville	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Severe: erodes easily.	Slight.
133--- Forbesville	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
134*, 135*: Forward Variant---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Kidd---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
136*, 137*: Freezeout---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
Yollabolly---	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
138*: Glenview---	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
Arrowhead---	Severe: small stones.	Severe: small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones.
139*: Glenview---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
Arrowhead---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, slope.
140*: Glenview---	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.
Bottlerock---	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones, droughty.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
141*:					
Henneke	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, small stones, depth to rock.	Slight	Severe: thin layer.
Montara	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Slight	Severe: thin layer.
142*:					
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Montara	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Rock outcrop.					
143*:					
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Okiota	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, thin layer.
144 Jafa	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Slight	Slight.
145 Jafa	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Slight	Moderate: slope.
146*:					
Jafa loam	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Jafa gravelly loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
147 Kelsey	Severe: flooding.	Slight	Moderate: small stones.	Slight	Slight.
148*:					
Kidd	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
Forward	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
149*:					
Kidd	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Forward	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
150 Kilaga Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.
151*:					
Konocti stony loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Konocti cobbly loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: large stones, slope.
Benridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
152*:					
Konocti	Moderate: slope, small stones, dusty.	Moderate: slope, small stones, dusty.	Severe: slope, small stones.	Moderate: dusty.	Moderate: small stones, droughty, slope.
Hambright	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
153*:					
Konocti	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, slope, thin layer.
154*:					
Konocti	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
Rock outcrop.					

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
155*:					
Konocti Variant	Moderate: slope, small stones, percs slowly.	Moderate: slope, small stones, percs slowly.	Severe: slope, small stones.	Slight	Moderate: small stones, large stones, slope.
Konocti	Moderate: slope, small stones.	Moderate: slope, small stones.	Severe: slope, small stones.	Moderate: dusty.	Severe: large stones.
Hambright	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.
156*:					
Konocti Variant	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Konocti	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: large stones, slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, slope, thin layer.
157--- Landlow Variant	Severe: flooding, wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.	Severe: wetness.
158--- Lupoyoma	Severe: flooding.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Slight.
159--- Manzanita	Moderate: dusty.	Moderate: dusty.	Moderate: slope, small stones, dusty.	Moderate: dusty.	Slight.
160--- Manzanita	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
161--- Manzanita	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
162--- Manzanita	Moderate: small stones.	Moderate: small stones.	Severe: small stones.	Moderate: dusty.	Moderate: small stones.
163--- Manzanita	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
164--- Maxwell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: percs slowly.	Slight	Slight.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
165--- Maxwell	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, percs slowly.	Slight---	Slight.
166*: Maymen---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope, dusty.	Severe: slope, thin layer.
Etsel---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: droughty, slope.
Mayacama---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
167*: Maymen---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Etsel---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope.
Mayacama---	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
168*: Maymen---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope, dusty.	Severe: slope, thin layer.
Etsel---	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, droughty, slope.
Snook---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
169*: Maymen---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Etsel---	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
169*:					
Snook	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
170*:					
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Etsel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
171*:					
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Etsel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope.
172*:					
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope, dusty.	Severe: slope, thin layer.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Mayacama	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Moderate: slope.	Severe: small stones, slope.
173*, 174*:					
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mayacama	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
175*: Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
176--- Maywood Variant	Severe: flooding.	Slight	Moderate: small stones, flooding.	Severe: erodes easily.	Moderate: droughty, flooding.
177*: Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
178*: Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
179*: Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
Squawrock	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Pomo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
180--- Mocho Variant	Slight	Slight	Slight	Slight	Slight.
181*: Neice	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
181*:					
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, slope, thin layer.
182*:					
Neice	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
183*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Bamtush	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Deadwood	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
184*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Deadwood	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Bamtush	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
185*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Decy	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
185*:					
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
186*, 187*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Deadwood	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
188*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
189*, 190*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sheetiron	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Deadwood	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
191*:					
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
192*:					
Okiota	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: small stones, slope, thin layer.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
192*:					
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Moderate: slope.	Severe: slope, thin layer.
193*:					
Okiota	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: small stones, slope, thin layer.
Henneke	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Dubakella	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
194 Oxalis Variant	Moderate: dusty.	Moderate: dusty.	Moderate: dusty.	Severe: erodes easily.	Slight.
195*:					
Phipps clay loam	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Phipps loam	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
196*:					
Phipps clay loam	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Phipps loam	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
197*:					
Phipps clay loam	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Phipps loam	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
198*:					
Pomo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
199*. Riverwash					
200*: Rock outcrop.					

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
200*:					
Etsel	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: droughty, slope.
Snook	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope.	Severe: slope, thin layer.
201*:					
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Kekawaka	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
202*:					
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Kekawaka	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
203 San Joaquin Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, cemented pan, percs slowly.	Severe: erodes easily.	Moderate: droughty, thin layer.
204*, 205*:					
Sheetiron	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Deadwood	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
206*:					
Shortyork Variant	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Yorkville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Squawrock	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
207*:					
Skyhigh	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Asbill	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
208*:					
Skyhigh	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Asbill	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
209*:					
Skyhigh	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
210*:					
Skyhigh	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: slope, thin layer.
Sleeper	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
Millsholm	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: thin layer.
211*:					
Skyhigh	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Sleeper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, thin layer.
212*:					
Skyhigh	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Sleeper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
213*:					
Sleeper Variant	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope.
Sleeper	Moderate: slope.	Moderate: slope.	Severe: slope.	Severe: erodes easily.	Moderate: slope.
214*:					
Sleeper Variant	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Sleeper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: erodes easily.	Severe: slope.
215*:					
Sleeper Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sleeper	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
216*:					
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Collayomi	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones.	Severe: small stones, droughty, slope.
Whispering	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
217*:					
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Collayomi	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Whispering	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
218*:					
Sobrante	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: thin layer, slope.
Guenoc	Moderate: slope.	Moderate: slope.	Severe: slope.	Slight	Moderate: slope, thin layer.
Hambright	Severe: small stones, depth to rock.	Severe: small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, thin layer.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
219*:					
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Guenoc	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope.	Severe: slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: small stones.	Severe: small stones, slope, thin layer.
220*:					
Sobrante	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hambright	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
Guenoc	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
221 Sodabay	Moderate: slope, dusty.	Moderate: slope, dusty.	Severe: slope.	Moderate: dusty.	Moderate: slope.
222 Sodabay	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
223*:					
Sodabay	Severe: slope.	Severe: slope.	Severe: slope.	Moderate: slope, dusty.	Severe: slope.
Konocti cobbly loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: large stones, slope.
Konocti stony loam	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
224*:					
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Marpa	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
225*, 226*:					
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Marpa	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
227*:					
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Millsholm	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, erodes easily.	Severe: slope, thin layer.
228*:					
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
229*:					
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Maymen	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
230*:					
Speaker	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
Speaker Variant	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: erodes easily.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
230*: Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope, dusty.	Severe: slope.
231*: Squawrock	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
Shortyork Variant	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Moderate: slope.	Severe: slope.
232, 233--- Still	Severe: flooding.	Moderate: dusty.	Moderate: small stones, dusty.	Moderate: dusty.	Slight.
234--- Still	Severe: flooding.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.	Moderate: small stones.
235*: Still	Severe: flooding.	Moderate: small stones, dusty.	Severe: small stones.	Moderate: dusty.	Moderate: small stones.
Talmage	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones, droughty.
236*: Stonyford	Severe: slope, depth to rock.	Severe: slope, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope.	Severe: slope, thin layer.
Guenoc	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
237--- Talmage	Severe: flooding, small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones.	Severe: small stones, droughty.
238--- Tulelake	Severe: flooding, ponding.	Severe: ponding.	Severe: ponding, flooding.	Severe: ponding, erodes easily.	Severe: ponding, flooding.
239--- Tulelake	Severe: flooding.	Moderate: wetness, percs slowly.	Moderate: wetness, percs slowly.	Severe: erodes easily.	Moderate: wetness.
240*: Tyson	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
Neuns	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
241*: Vitrandepts. Cinder land.					
242---- Wappo	Moderate: percs slowly, dusty.	Moderate: percs slowly, dusty.	Moderate: slope, percs slowly, dusty.	Severe: erodes easily.	Moderate: droughty.
243---- Wappo	Moderate: slope, percs slowly, dusty.	Moderate: slope, percs slowly, dusty.	Severe: slope.	Severe: erodes easily.	Moderate: droughty, slope.
244---- Wappo Variant	Severe: percs slowly.	Severe: percs slowly.	Severe: percs slowly.	Slight----	Moderate: droughty.
245*: Whispering----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Collayomi very gravelly loam----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: small stones, droughty, slope.
Collayomi stony loam-	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Severe: large stones, droughty, slope.
246---- Wolfcreek	Severe: flooding.	Moderate: small stones, percs slowly.	Severe: small stones.	Slight----	Moderate: small stones.
247---- Wolfcreek	Severe: flooding.	Moderate: small stones, dusty.	Moderate: small stones, dusty.	Severe: erodes easily.	Slight.
248. Xerofluvents					
249*: Xerofluvents. Riverwash.					
250*: Yollabolly----	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
Freezeout----	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.

See footnote at end of table.

TABLE 10.--RECREATIONAL DEVELOPMENT--Continued

Soil name and map symbol	Camp areas	Picnic areas	Playgrounds	Paths and trails	Golf fairways
251*:					
Yollabolly	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones, depth to rock.	Severe: slope, small stones.	Severe: small stones, slope, thin layer.
Rock outcrop.					
Freezeout	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope, small stones.	Severe: slope.	Severe: small stones, slope.
252*:					
Yorktree	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Squawrock	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
253*:					
Yorkville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pomo	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope, erodes easily.	Severe: slope.
254*:					
Yorkville	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Yorktree	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Squawrock	Severe: slope.	Severe: slope.	Severe: slope, small stones.	Severe: slope.	Severe: slope.
255 Yorkville Variant	Moderate: percs slowly.	Moderate: percs slowly.	Moderate: slope, small stones, percs slowly.	Slight	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 11.--BUILDING SITE DEVELOPMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
101*:						
Aiken	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope.
Sobrante	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, low strength, slope.	Moderate: thin layer, slope.
102*:						
Aiken	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Sobrante	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
103 Asbill	Moderate: depth to rock, too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: thin layer.
104 Asbill	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
105*. Badland						
106*:						
Bally	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones, droughty.
Phipps	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones.
107*:						
Bally	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Phipps	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
108*:						
Bally	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Phipps	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Haploxeralfs.						

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
109*:						
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
110*, 111*:						
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
112*, 113*:						
Benridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Konocti cobbly loam	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Konocti stony loam	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
114*:						
Benridge	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: slope.
Sodabay	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: slope.
115*:						
Benridge	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sodabay	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
116 Benridge Variant	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: shrink-swell.	Moderate: droughty, slope, thin layer.
117*, 118*:						
Bottlerock	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
117*, 118*: Glenview	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Arrowhead	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
119*: Bressa	Moderate: depth to rock, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
Millsholm	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
120*: Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
121--- Clear Lake	Severe: cutbanks cave.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
122--- Clear Lake Variant	Moderate: too clayey, wetness.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Severe: too clayey.
123--- Cole	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
124, 125--- Cole Variant	Moderate: too clayey.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Slight.
126*: Collayomi very gravelly loam---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Collayomi stony loam---	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, droughty, slope.
127*, 128*: Collayomi	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
127*, 128*:						
Aiken	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Whispering	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
129*:						
Collayomi	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Whispering	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
130*:						
Deadwood	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
Sheetiron	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
131. Fluvaquentic Haplaquolls						
132--- Forbesville	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
133--- Forbesville	Moderate: too clayey, slope.	Severe: shrink-swell.	Moderate: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
134*, 135*:						
Forward Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Kidd	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
136*, 137*:						
Freezeout	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Yollabolly	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
138*:						
Glenview	Moderate: depth to rock, too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Severe: small stones.
Arrowhead	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, slope, shrink-swell.	Severe: small stones.
139*:						
Glenview	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
Arrowhead	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
140*:						
Glenview	Moderate: depth to rock, too clayey.	Moderate: shrink-swell.	Moderate: depth to rock, shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Severe: small stones.
Bottlerock	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Severe: small stones, droughty.
141*:						
Henneke	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
Montara	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
142*:						
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Montara	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Rock outcrop.						
143*:						
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Okiota	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: small stones, slope, thin layer.
144--- Jafa	Slight---	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
145---------- Jafa	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell.	Moderate: slope.
146*: Jafa loam--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Jafa gravelly loam----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
147---------- Kelsey	Slight---------	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
148*, 149*: Kidd----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Forward----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
150---------- Kilaga Variant	Moderate: too clayey, wetness.	Moderate: shrink-swell.	Moderate: wetness, shrink-swell.	Moderate: shrink-swell.	Severe: low strength.	Slight.
151*: Konocti stony loam----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Konocti cobbly loam----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Benridge---------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
152*: Konocti----------	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, low strength, slope.	Moderate: small stones, droughty, slope.
Hambright--------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
153*: Konocti----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hambright--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
154*:						
Konocti	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hambright	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
Rock outcrop.						
155*:						
Konocti Variant	Moderate: depth to rock, large stones, slope.	Moderate: shrink-swell, slope, large stones.	Moderate: depth to rock, slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell, large stones.	Moderate: small stones, large stones, slope.
Konocti	Severe: depth to rock.	Moderate: slope, depth to rock, large stones.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, low strength, slope.	Severe: large stones.
Hambright	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
156*:						
Konocti Variant	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Konocti	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Hambright	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
157--- Landlow Variant	Severe: wetness.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: low strength, wetness, flooding.	Severe: wetness.
158--- Lupoyoma	Slight---	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Slight.
159--- Manzanita	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell.	Moderate: low strength, shrink-swell.	Slight.
160--- Manzanita	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Severe: shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: slope.
161--- Manzanita	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
162---------- Manzanita	Moderate: too clayey.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Moderate: small stones.
163---------- Manzanita	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
164, 165---------- Maxwell	Severe: cutbanks cave.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
166*, 167*: Maymen----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Etsel----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope.
Mayacama----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
168*: Maymen----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Etsel----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
Snook----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
169*: Maymen----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Etsel----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope.
Snook----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
170*: Maymen----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Etsel----------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
170*: Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
171*: Maymen	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Etsel	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope.
172*, 173*, 174*: Maymen	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Mayacama	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
175*: Maymen	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
176 Maywood Variant	Moderate: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: droughty, flooding.
177*: Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
178*: Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
178*:						
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
179*:						
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Squawrock	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Pomo	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope.	Severe: slope.
180--- Mocho Variant	Moderate: wetness.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Moderate: shrink-swell.	Slight.
181*, 182*:						
Neice	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sobrante	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hambright	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
183*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Deadwood	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
184*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Deadwood	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
184*:						
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
185*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Decy	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
186*, 187*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Deadwood	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
188*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
189*, 190*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sheetiron	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Deadwood	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
191*:						
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
192*:						
Okiota	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: small stones, slope, thin layer.
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
193*:						
Okiota	Severe: depth to rock, slope.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope, depth to rock.	Severe: depth to rock, low strength, slope.	Severe: small stones, slope, thin layer.
Henneke	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Dubakella	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
194 Oxalis Variant	Moderate: too clayey.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Slight.
195*:						
Phipps clay loam	Moderate: too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Phipps loam	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: slope, shrink-swell.	Moderate: slope.
196*, 197*:						
Phipps clay loam	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Phipps loam	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
198*:						
Pomo	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope.	Severe: slope.
Bressa	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
199*. Riverwash						
200*: Rock outcrop.						

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
200*:						
Etsel	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: droughty, slope.
Snook	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
201*, 202*:						
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Kekawaka	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
203 San Joaquin Variant	Severe: cemented pan, cutbanks cave.	Moderate: cemented pan.	Severe: cemented pan.	Moderate: cemented pan.	Severe: low strength, shrink-swell.	Moderate: droughty, thin layer.
204*, 205*:						
Sheetiron	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Deadwood	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, droughty, slope.
206*:						
Shortyork Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Yorkville	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Squawrock	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
207*:						
Skyhigh	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
Asbill	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
208*:						
Skyhigh	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Asbill	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
209*:						
Skyhigh	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
210*:						
Skyhigh	Severe: depth to rock.	Severe: shrink-swell.	Severe: depth to rock, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope, thin layer.
Sleeper	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.
Millsholm	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: thin layer.
211*, 212*:						
Skyhigh	Severe: depth to rock, slope.	Severe: shrink-swell, slope.	Severe: depth to rock, slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Sleeper	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
213*:						
Sleeper Variant	Moderate: too clayey, slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: slope.
Sleeper	Moderate: depth to rock, too clayey, slope.	Severe: shrink-swell.	Severe: shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
214*, 215*:						
Sleeper Variant--	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sleeper----------	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
216*, 217*:						
Sobrante---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Collayomi--------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.
Whispering-------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
218*:						
Sobrante---------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Moderate: depth to rock, low strength, slope.	Moderate: thin layer, slope.
Guenoc-----------	Severe: depth to rock.	Moderate: shrink-swell, slope, depth to rock.	Severe: depth to rock.	Severe: slope.	Severe: low strength.	Moderate: slope, thin layer.
Hambright--------	Severe: depth to rock.	Severe: depth to rock.	Severe: depth to rock.	Severe: slope, depth to rock.	Severe: depth to rock.	Severe: small stones, thin layer.
219*:						
Sobrante---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Guenoc-----------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
Hambright--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
220*:						
Sobrante---------	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Hambright--------	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
220*:						
Guenoc	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
221 Sodabay	Moderate: slope.	Moderate: shrink-swell, slope.	Moderate: slope, shrink-swell.	Severe: slope.	Moderate: low strength, slope, shrink-swell.	Moderate: slope.
222 Sodabay	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
223*:						
Sodabay	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Konocti cobbly loam	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: large stones, slope.
Konocti stony loam	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
224*:						
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Marpa	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
225*, 226*:						
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Maymen	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Marpa	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
227*:						
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Maymen	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Millsholm	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
228*:						
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
229*:						
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Maymen	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
230*:						
Speaker	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Speaker Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope, thin layer.
Sanhedrin	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
231*:						
Squawrock	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Shortyork Variant	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
232--- Still	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding.	Slight.
233--- Still	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: low strength, flooding, shrink-swell.	Slight.
234--- Still	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, shrink-swell.	Moderate: small stones.
235*:						
Still	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, shrink-swell.	Moderate: small stones.
Talmage	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Severe: small stones, droughty.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
236*:						
Stonyford	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, thin layer.
Guenoc	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: low strength, slope.	Severe: slope.
237---------- Talmage	Severe: cutbanks cave.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding.	Severe: small stones, droughty.
238---------- Tulelake	Severe: ponding.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: flooding, ponding, shrink-swell.	Severe: low strength, ponding, flooding.	Severe: ponding, flooding.
239---------- Tulelake	Severe: wetness.	Severe: flooding, shrink-swell.	Severe: flooding, wetness, shrink-swell.	Severe: flooding, shrink-swell.	Severe: low strength, shrink-swell.	Moderate: wetness.
240*:						
Tyson	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Neuns	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
241*: Vitrandepts. Cinder land.						
242---------- Wappo	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty.
243---------- Wappo	Moderate: too clayey, slope.	Severe: shrink-swell.	Moderate: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, shrink-swell.	Moderate: droughty, slope.
244---------- Wappo Variant	Moderate: too clayey.	Severe: shrink-swell.	Moderate: shrink-swell.	Severe: shrink-swell.	Severe: low strength, shrink-swell.	Moderate: droughty.
245*:						
Whispering	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
Collayomi very gravelly loam	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: small stones, droughty, slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
245*: Collayomi stony loam	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: large stones, droughty, slope.
246--- Wolfcreek	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, shrink-swell.	Moderate: small stones.
247--- Wolfcreek	Slight	Severe: flooding.	Severe: flooding.	Severe: flooding.	Moderate: flooding, shrink-swell.	Slight.
248. Xerofluvents						
249*: Xerofluvents.						
Riverwash.						
250*: Yollabolly	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
Freezeout	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
251*: Yollabolly	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: slope, depth to rock.	Severe: depth to rock, slope.	Severe: small stones, slope, thin layer.
Rock outcrop.						
Freezeout	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: small stones, slope.
252*: Yorktree	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Hopland	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.
Squawrock	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.

See footnote at end of table.

TABLE 11.--BUILDING SITE DEVELOPMENT--Continued

Soil name and map symbol	Shallow excavations	Dwellings without basements	Dwellings with basements	Small commercial buildings	Local roads and streets	Lawns and landscaping
253*:						
Yorkville	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Pomo	Severe: slope.	Severe: slope.	Severe: slope, shrink-swell.	Severe: slope.	Severe: slope.	Severe: slope.
254*:						
Yorkville	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Yorktree	Severe: slope.	Severe: shrink-swell, slope.	Severe: slope, shrink-swell.	Severe: shrink-swell, slope.	Severe: low strength, slope, shrink-swell.	Severe: slope.
Squawrock	Severe: depth to rock, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Severe: slope.	Severe: slope.
255--- Yorkville Variant	Moderate: too clayey.	Moderate: shrink-swell.	Severe: shrink-swell.	Moderate: shrink-swell, slope.	Moderate: shrink-swell.	Slight.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 12.--SANITARY FACILITIES

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "good," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
101*:					
Aiken	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
Sobrante	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
102*:					
Aiken	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Sobrante	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
103 Asbill	Severe: depth to rock, percs slowly.	Severe: depth to rock.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
104 Asbill	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
105*. Badland					
106*:					
Bally	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
Phipps	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Fair: too clayey, small stones.
107*:					
Bally	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Phipps	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
108*:					
Bally	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
108*:					
Phipps	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Haploxeralfs.					
109*:					
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
110*, 111*:					
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
112*, 113*:					
Benridge	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Konocti cobbly loam	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Konocti stony loam	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
114*:					
Benridge	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Sodabay	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
115*:					
Benridge	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Sodabay	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
116--- Benridge Variant	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
117*, 118*:					
Bottlerock	Severe: percs slowly, slope.	Severe: seepage, slope.	Severe: slope, too clayey.	Severe: seepage, slope.	Poor: too clayey, small stones, slope.
Glenview	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Arrowhead	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
119*:					
Bressa	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Millsholm	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
120*:					
Bressa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
121--- Clear Lake	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
122--- Clear Lake Variant	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
123--- Cole	Severe: percs slowly.	Severe: flooding.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
124, 125---------- Cole Variant	Severe: percs slowly.	Severe: flooding.	Severe: too clayey.	Moderate: flooding.	Poor: too clayey, hard to pack.
126*: Collayomi very gravelly loam-----	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Collayomi stony loam----------	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.
127*, 128*: Collayomi----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Aiken----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Whispering---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
129*: Collayomi----------	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Whispering---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
130*: Deadwood----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
Sheetiron----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
131. Fluvaquentic Haplaquolls					
132---------- Forbesville	Severe: percs slowly.	Moderate: seepage, slope.	Severe: too clayey.	Slight----------	Poor: too clayey, small stones.
133---------- Forbesville	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, small stones.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
134*, 135*: Forward Variant	Severe: slope.	Severe: seepage, slope.	Severe: seepage, slope.	Severe: seepage, slope.	Poor: small stones, slope.
Kidd	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
136*, 137*: Freezeout	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
Yollabolly	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
138*: Glenview	Severe: percs slowly.	Severe: slope.	Severe: depth to rock.	Moderate: depth to rock, slope.	Fair: area reclaim, too clayey, slope.
Arrowhead	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
139*: Glenview	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Arrowhead	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
140*: Glenview	Severe: percs slowly.	Moderate: depth to rock, slope.	Severe: depth to rock.	Moderate: depth to rock.	Fair: area reclaim, too clayey.
Bottlerock	Severe: percs slowly.	Severe: seepage.	Severe: too clayey.	Severe: seepage.	Poor: too clayey, small stones.
141*: Henneke	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, small stones.
Montara	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
142*:					
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
Montara	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
143*:					
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
Okiota	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
144--- Jafa	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Poor: small stones.
145--- Jafa	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: small stones.
146*:					
Jafa loam	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Jafa gravelly loam	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
147--- Kelsey	Moderate: flooding.	Severe: seepage, flooding.	Severe: seepage.	Severe: seepage.	Good.
148*, 149*:					
Kidd	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, slope.
Forward	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
150--- Kilaga Variant	Severe: wetness, percs slowly.	Severe: wetness.	Moderate: wetness, too clayey.	Slight	Poor: thin layer.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
151*:					
Konocti stony loam-	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Konocti cobbly loam	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Benridge----------	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
152*:					
Konocti----------	Severe: depth to rock, percs slowly.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, large stones.
Hambright---------	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
153*:					
Konocti----------	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Hambright---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
154*:					
Konocti----------	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Hambright---------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Rock outcrop.					
155*:					
Konocti Variant----	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, large stones.	Moderate: depth to rock, slope.	Poor: large stones.
Konocti----------	Severe: depth to rock, percs slowly.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage.	Severe: depth to rock, seepage.	Poor: area reclaim, large stones.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
155*: Hambright	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.
156*: Konocti Variant	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, large stones.	Severe: slope.	Poor: large stones, slope.
Konocti	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Hambright	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
157--- Landlow Variant	Severe: flooding, wetness, percs slowly.	Severe: flooding, wetness.	Severe: flooding, wetness, too clayey.	Severe: flooding, wetness.	Poor: too clayey, hard to pack, wetness.
158--- Lupoyoma	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
159--- Manzanita	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
160--- Manzanita	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
161--- Manzanita	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
162--- Manzanita	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
163--- Manzanita	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
164--- Maxwell	Severe: wetness, percs slowly.	Moderate: wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.
165--- Maxwell	Severe: wetness, percs slowly.	Moderate: slope, wetness.	Severe: wetness, too clayey.	Moderate: wetness.	Poor: too clayey, hard to pack.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
166*, 167*:					
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Etsel	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Mayacama	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
168*, 169*:					
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Etsel	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Snook	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
170*:					
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Etsel	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
171*:					
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Hopland	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Etsel	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
172*, 173*, 174*:					
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
172*, 173*, 174*: Hopland	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Mayacama	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
175*: Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Bressa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
176--Maywood Variant	Severe: flooding.	Severe: flooding.	Severe: flooding.	Severe: flooding.	Good.
177*: Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Bressa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
178*: Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Bressa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Hopland	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
179*: Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
179*:					
Squawrock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Pomo	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
180 Mocho Variant	Severe: percs slowly.	Severe: seepage.	Moderate: too clayey.	Slight	Fair: too clayey.
181*, 182*:					
Neice	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: slope, too clayey, small stones.
Sobrante	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Hambright	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
183*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Deadwood	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
184*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Deadwood	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
Bamtush	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
185*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Decy	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, small stones, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
186*, 187*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Deadwood	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
188*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
189*, 190*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Sheetiron	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Deadwood	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
191*:					
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
192*:					
Okiota	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
193*:					
Okiota	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Henneke	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
Dubakella	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
194 Oxalis Variant	Severe: percs slowly.	Slight	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.
195*:					
Phipps clay loam	Severe: percs slowly.	Severe: slope.	Severe: too clayey.	Moderate: slope.	Poor: too clayey, hard to pack.
Phipps loam	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
196*, 197*:					
Phipps clay loam	Severe: percs slowly, slope.	Severe: slope.	Severe: slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Phipps loam	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
198*:					
Pomo	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.
Bressa	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
199*. Riverwash					
200*: Rock outcrop.					
Etsel	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Snook	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
201*, 202*:					
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
Kekawaka	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
203 San Joaquin Variant	Severe: cemented pan, percs slowly.	Severe: cemented pan.	Severe: cemented pan, seepage, too sandy.	Severe: cemented pan, seepage.	Poor: area reclaim.
204*, 205*:					
Sheetiron	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Deadwood	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
206*:					
Shortyork Variant	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
206*:					
Yorkville	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Squawrock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
207*:					
Skyhigh	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Asbill	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
208*:					
Skyhigh	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Asbill	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
209*:					
Skyhigh	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
210*:					
Skyhigh	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock, too clayey.	Severe: depth to rock.	Poor: area reclaim, too clayey, hard to pack.
Sleeper	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
Millsholm	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
211*, 212*:					
Skyhigh	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, hard to pack.
Sleeper	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
213*:					
Sleeper Variant	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Poor: thin layer.
Sleeper	Severe: percs slowly.	Severe: slope.	Severe: depth to rock, too clayey.	Moderate: depth to rock, slope.	Poor: too clayey, hard to pack.
214*, 215*:					
Sleeper Variant	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope, thin layer.
Sleeper	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
216*, 217*:					
Sobrante	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Collayomi	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Whispering	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
218*:					
Sobrante	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Guenoc	Severe: depth to rock, percs slowly.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim.
Hambright	Severe: depth to rock.	Severe: depth to rock, slope.	Severe: depth to rock.	Severe: depth to rock.	Poor: area reclaim, small stones.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
219*:					
Sobrante	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Guenoc	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Hambright	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
220*:					
Sobrante	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Hambright	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Guenoc	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
221 Sodabay	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, small stones, slope.
222 Sodabay	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
223*:					
Sodabay	Severe: percs slowly, slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: slope.
Konocti cobbly loam	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
Konocti stony loam	Severe: depth to rock, percs slowly, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, large stones, slope.
224*:					
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
224*:					
Marpa	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
225*, 226*:					
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Marpa	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
227*:					
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Millsholm	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
228*:					
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
229*:					
Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
229*: Maymen	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
230*: Speaker	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: depth to rock, slope.
Speaker Variant	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Sanhedrin	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope.	Severe: slope.	Poor: slope.
231*: Squawrock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
Shortyork Variant	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope, too clayey.	Severe: depth to rock, slope.	Poor: area reclaim, too clayey, small stones.
232--- Still	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
233--- Still	Severe: percs slowly.	Severe: seepage, flooding.	Severe: seepage.	Moderate: flooding.	Fair: too clayey, thin layer.
234--- Still	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey, small stones.
235*: Still	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey, small stones.
Talmage	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
236*: Stonyford	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
236*: Guenoc	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
237--- Talmage	Severe: poor filter.	Severe: seepage, flooding.	Severe: seepage, too sandy.	Severe: seepage.	Poor: seepage, too sandy, small stones.
238--- Tulelake	Severe: flooding, ponding, percs slowly.	Severe: flooding, ponding.	Severe: flooding, ponding, too clayey.	Severe: flooding, ponding.	Poor: too clayey, hard to pack, ponding.
239--- Tulelake	Severe: wetness, percs slowly.	Severe: flooding, wetness.	Severe: wetness, too clayey.	Severe: wetness.	Poor: too clayey, hard to pack.
240*: Tyson	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Neuns	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
241*: Vitrandepts. Cinder land.					
242--- Wappo	Severe: percs slowly.	Moderate: seepage, slope.	Moderate: too clayey.	Slight	Fair: too clayey.
243--- Wappo	Severe: percs slowly.	Severe: slope.	Moderate: slope, too clayey.	Moderate: slope.	Fair: too clayey, slope.
244--- Wappo Variant	Severe: percs slowly.	Moderate: slope.	Moderate: too clayey.	Slight	Poor: small stones.
245*: Whispering	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, small stones, slope.
Collayomi very gravelly loam	Severe: slope.	Severe: slope.	Severe: slope.	Severe: slope.	Poor: small stones, slope.
Collayomi stony loam	Severe: slope.	Severe: slope, large stones.	Severe: slope, large stones.	Severe: slope.	Poor: large stones, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
246, 247---------- Wolfcreek	Severe: percs slowly.	Severe: flooding.	Moderate: flooding, too clayey.	Moderate: flooding.	Fair: too clayey.
248. Xerofluvents					
249*: Xerofluvents.					
Riverwash.					
250*: Yollabolly----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Freezeout----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
251*: Yollabolly----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Rock outcrop.					
Freezeout----------	Severe: depth to rock, slope.	Severe: seepage, depth to rock, slope.	Severe: depth to rock, seepage, slope.	Severe: depth to rock, seepage, slope.	Poor: area reclaim, seepage, small stones.
252*: Yorktree----------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Hopland----------	Severe: depth to rock, percs slowly, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, slope.
Squawrock----------	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
253*: Yorkville----------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Pomo----------	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, small stones, slope.

See footnotes at end of table.

TABLE 12.--SANITARY FACILITIES--Continued

Soil name and map symbol	Septic tank absorption fields	Sewage lagoon areas 1/	Trench sanitary landfill	Area sanitary landfill	Daily cover for landfill
254*: Yorkville	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Yorktree	Severe: percs slowly, slope.	Severe: slope.	Severe: depth to rock, slope, too clayey.	Severe: slope.	Poor: too clayey, hard to pack, slope.
Squawrock	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Severe: depth to rock, slope.	Poor: area reclaim, large stones, slope.
255--- Yorkville Variant	Severe: percs slowly.	Moderate: slope.	Severe: too clayey.	Slight	Poor: too clayey, hard to pack.

* See description of the map unit for composition and behavior characteristics of the map unit.

1/ If flood water will not enter or damage sewage lagoons (low velocity and depth of less than 5 feet), disregard flooding.

TABLE 13.--CONSTRUCTION MATERIALS

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "good," "fair," and other terms. Absence of an entry indicates that the soil was not rated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
101*: Aiken	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
Sobrante	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
102*: Aiken	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sobrante	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
103, 104 Asbill	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
105*. Badland				
106*: Bally	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
Phipps	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
107*: Bally	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Phipps	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
108*: Bally	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Phipps	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Haploxeralfs.				

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
109*:				
Bamtush	Fair: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Neuns	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
110*, 111*:				
Bamtush	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
112*:				
Benridge	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Konocti cobbly loam	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Konocti stony loam	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
113*:				
Benridge	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Konocti cobbly loam	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Konocti stony loam	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
114*:				
Benridge	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Sodabay	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
115*:				
Benridge	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sodabay	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
116--- Benridge Variant	Poor: area reclaim, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
117*:				
Bottlerock	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Glenview	Fair: area reclaim, slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Arrowhead	Poor: area reclaim.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
118*:				
Bottlerock	Poor: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Glenview	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Arrowhead	Poor: area reclaim, slope.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
119*:				
Bressa	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, small stones, slope.
Millsholm	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
120*:				
Bressa	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Millsholm	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
121--- Clear Lake	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
122--Clear Lake Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: too clayey.
123--Cole	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
124, 125--Cole Variant	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
126*:				
Collayomi very gravelly loam	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Collayomi stony loam	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
127*:				
Collayomi	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Aiken	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Whispering	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
128*:				
Collayomi	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Aiken	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Whispering	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
129*:				
Collayomi	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Whispering	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
130*:				
Deadwood	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
130*: Sheetiron	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
131. Fluvaquentic Haplaquolls				
132, 133 Forbesville	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
134*, 135*: Forward Variant	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Kidd	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
136*, 137*: Freezeout	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope.
Yollabolly	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
138*: Glenview	Fair: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Arrowhead	Poor: area reclaim.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones.
139*: Glenview	Fair: area reclaim, slope, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Arrowhead	Poor: area reclaim.	Improbable: excess fines, large stones.	Improbable: excess fines, large stones.	Poor: small stones, slope.
140*: Glenview	Fair: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Bottlerock	Poor: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
141*: Henneke	Poor: area reclaim.	Poor: area reclaim, small stones.	Improbable: excess fines.	Poor: area reclaim, small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
141*:				
Montara	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
142*:				
Henneke	Poor: area reclaim, slope.	Poor: area reclaim, small stones.	Improbable: excess fines.	Poor: area reclaim, small stones.
Montara	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
143*:				
Henneke	Poor: area reclaim, slope.	Poor: area reclaim, small stones.	Improbable: excess fines.	Poor: area reclaim, small stones.
Okiota	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
144, 145 Jafa	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
146*:				
Jafa loam	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Jafa gravelly loam	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
147 Kelsey	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
148*:				
Kidd	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Forward	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
149*:				
Kidd	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Forward	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
150--- Kilaga Variant	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer.
151*: Konocti stony loam---	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Konocti cobbly loam--	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Benridge---	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
152*: Konocti---	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hambright---	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
153*: Konocti---	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hambright---	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
154*: Konocti---	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hambright---	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
155*: Konocti Variant---	Fair: area reclaim, large stones.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
Konocti---	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones.
Hambright---	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
156*: Konocti Variant---	Fair: area reclaim, large stones, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
156*: Konocti	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Hambright	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
157--- Landlow Variant	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
158--- Lupoyoma	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Good.
159--- Manzanita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
160--- Manzanita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, slope.
161--- Manzanita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
162--- Manzanita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
163--- Manzanita	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
164, 165--- Maxwell	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: too clayey.
166*: Maymen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Etsel	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Mayacama	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
167*: Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
167*:				
Etsel	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Mayacama	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
168*:				
Maymen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Etsel	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Snook	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
169*:				
Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Etsel	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Snook	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
170*:				
Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Etsel	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
171*:				
Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Hopland	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
171*: Etsel	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
172*: Maymen	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Hopland	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mayacama	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
173*, 174*: Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Hopland	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Mayacama	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
175*: Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Bressa	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
176 Maywood Variant	Good	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.
177*: Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Bressa	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
178*: Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
178*:				
Bressa	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Hopland	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
179*:				
Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Squawrock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Pomo	Poor: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
180 Mocho Variant	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim.
181*:				
Neice	Fair: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope, area reclaim.
Sobrante	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hambright	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
182*:				
Neice	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope, area reclaim.
Sobrante	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hambright	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
183*:				
Neuns	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
183*:				
Bamtush	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Deadwood	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
184*:				
Neuns	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Deadwood	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
Bamtush	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
185*:				
Neuns	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Decy	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
186*, 187*:				
Neuns	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Deadwood	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
188*:				
Neuns	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
188*: Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
189*, 190*: Neuns	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sheetiron	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Deadwood	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
191*: Neuns	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Speaker	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
192*: Okiota	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Henneke	Poor: area reclaim.	Poor: area reclaim, small stones.	Improbable: excess fines.	Poor: area reclaim, small stones.
193*: Okiota	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
Henneke	Poor: area reclaim, slope.	Poor: area reclaim, small stones.	Improbable: excess fines.	Poor: area reclaim, small stones.
Dubakella	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
194--- Oxalis Variant	Fair: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
195*: Phipps clay loam	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Phipps loam	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
196*:				
Phipps clay loam-----	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Phipps loam----------	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
197*:				
Phipps clay loam-----	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Phipps loam----------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
198*:				
Pomo-----------------	Poor: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Bressa---------------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
199*. Riverwash				
200*: Rock outcrop.				
Etsel----------------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Snook----------------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
201*:				
Sanhedrin------------	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Kekawaka-------------	Poor: low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Speaker--------------	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
202*:				
Sanhedrin------------	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
202*:				
Kekawaka	Poor: low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
203	Poor:	Improbable:	Improbable:	Poor:
San Joaquin Variant	area reclaim.	excess fines.	excess fines.	area reclaim.
204*, 205*:				
Sheetiron	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Deadwood	Poor: area reclaim, slope.	Improbable: small stones.	Improbable: thin layer.	Poor: area reclaim, small stones, slope.
206*:				
Shortyork Variant	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Yorkville	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Squawrock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
207*:				
Skyhigh	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Asbill	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Fair: area reclaim, too clayey.
208*:				
Skyhigh	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Asbill	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
209*:				
Skyhigh	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
210*:				
Skyhigh	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Sleeper	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
Millsholm	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
211*:				
Skyhigh	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Sleeper	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Millsholm	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
212*:				
Skyhigh	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Sleeper	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
213*:				
Sleeper Variant	Fair: low strength, thin layer.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, thin layer, slope.
Sleeper	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
214*:				
Sleeper Variant	Fair: low strength, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Sleeper	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
215*:				
Sleeper Variant	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
215*:				
Sleeper	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
216*:				
Sobrante	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Collayomi	Fair: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Whispering	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
217*:				
Sobrante	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Collayomi	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Whispering	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
218*:				
Sobrante	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Guenoc	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Hambright	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones.
219*:				
Sobrante	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Guenoc	Poor: area reclaim, low strength.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hambright	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
220*:				
Sobrante	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
220*: Hambright	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Guenoc	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
221 Sodabay	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones, area reclaim, slope.
222 Sodabay	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
223*: Sodabay	Fair: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.
Konocti cobbly loam	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
Konocti stony loam	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, slope.
224*: Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Marpa	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
225*, 226*: Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Marpa	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
227*:				
Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Millsholm	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, slope.
228*:				
Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
229*:				
Speaker	Poor: depth to rock, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Sanhedrin	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Maymen	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
230*:				
Speaker	Poor: depth to rock.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Speaker Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Sanhedrin	Fair: area reclaim, thin layer, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
231*:				
Squawrock	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Shortyork Variant	Poor: area reclaim.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
232 Still	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Fair: small stones.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
233---------- Still	Fair: low strength, thin layer, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
234---------- Still	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
235*: Still----------	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.
Talmage----------	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
236*: Stonyford----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Guenoc----------	Poor: area reclaim, low strength, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
237---------- Talmage	Good----------	Probable----------	Probable----------	Poor: small stones, area reclaim.
238---------- Tulelake	Poor: low strength, wetness, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, wetness.
239---------- Tulelake	Poor: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
240*: Tyson----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Neuns----------	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
241*: Vitrandepts. Cinder land.				
242, 243---------- Wappo	Fair: low strength, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer.
244---------- Wappo Variant	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
245*: Whispering	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Collayomi very gravelly loam	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
Collayomi stony loam	Poor: slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: large stones, area reclaim, slope.
246 Wolfcreek	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim.
247 Wolfcreek	Good	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim.
248. Xerofluvents				
249*: Xerofluvents.				
Riverwash.				
250*: Yollabolly	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Freezeout	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope.
251*: Yollabolly	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: area reclaim, small stones, slope.
Rock outcrop.				
Freezeout	Poor: area reclaim, slope.	Improbable: thin layer.	Improbable: thin layer.	Poor: small stones, slope.
252*: Yorktree	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Hopland	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: slope.

See footnote at end of table.

TABLE 13.--CONSTRUCTION MATERIALS--Continued

Soil name and map symbol	Roadfill	Sand	Gravel	Topsoil
252*:				
Squawrock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
253*:				
Yorkville	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Pomo	Poor: slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, area reclaim, slope.
254*:				
Yorkville	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: thin layer, slope.
Yorktree	Poor: low strength, slope, shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
Squawrock	Poor: area reclaim, slope.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones, slope.
255--Yorkville Variant	Fair: shrink-swell.	Improbable: excess fines.	Improbable: excess fines.	Poor: small stones.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 14.--WATER MANAGEMENT

[Some terms that describe restrictive soil features are defined in the Glossary. See text for definitions of "slight," "moderate," and "severe." Absence of an entry indicates that the soil was not evaluated. The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation]

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
101*, 102*: Aiken	Severe: slope.	Hard to pack	Deep to water	Slope	Slope	Slope.
Sobrante	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
103 Asbill	Moderate: depth to rock, slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock.	Depth to rock, percs slowly.	Depth to rock, percs slowly.
104 Asbill	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
105*. Badland						
106*: Bally	Moderate: slope.	Slight	Deep to water	Droughty, percs slowly, slope.	Favorable	Droughty, percs slowly.
Phipps	Moderate: slope.	Severe: piping.	Deep to water	Percs slowly, slope.	Favorable	Percs slowly.
107*: Bally	Severe: slope.	Slight	Deep to water	Droughty, percs slowly, slope.	Slope	Slope, droughty, percs slowly.
Phipps	Severe: slope.	Severe: piping.	Deep to water	Percs slowly, slope.	Slope	Slope, percs slowly.
108*: Bally	Severe: slope.	Slight	Deep to water	Droughty, percs slowly, slope.	Slope	Slope, droughty, percs slowly.
Phipps	Severe: slope.	Severe: piping.	Deep to water	Percs slowly, slope.	Slope	Slope, percs slowly.
Haploxeralfs.						
109*: Bamtush	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
110*, 111*: Bamtush	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
110*, 111*:						
Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
112*, 113*:						
Benridge	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope	Slope.
Konocti cobbly loam	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Konocti stony loam	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
114*, 115*:						
Benridge	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope	Slope.
Sodabay	Severe: slope.	Severe: thin layer.	Deep to water	Slope	Slope	Slope.
116--- Benridge Variant	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
117*, 118*:						
Bottlerock	Severe: slope.	Slight	Deep to water	Droughty, percs slowly, slope.	Slope, percs slowly.	Slope, droughty, percs slowly.
Glenview	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
Arrowhead	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
119*, 120*:						
Bressa	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Millsholm	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
121--- Clear Lake	Slight	Moderate: hard to pack, wetness.	Deep to water1/	Slow intake, percs slowly.	Percs slowly	Percs slowly.
122--- Clear Lake Variant	Slight	Moderate: hard to pack, wetness.	Deep to water1/	Slow intake, percs slowly.	Percs slowly	Percs slowly.
123--- Cole	Slight	Slight	Deep to water	Percs slowly	Percs slowly	Percs slowly.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
124, 125---------- Cole Variant	Slight---------	Moderate: hard to pack.	Deep to water	Percs slowly---	Percs slowly---	Percs slowly.
126*: Collayomi very gravelly loam---	Severe: slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Collayomi stony loam----------	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
127*, 128*: Collayomi--------	Severe: slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Aiken----------	Severe: slope.	Hard to pack---	Deep to water	Slope----------	Slope----------	Slope.
Whispering-------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
129*: Collayomi--------	Severe: slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Whispering-------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
130*: Deadwood---------	Severe: depth to rock, slope.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sheetiron--------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
131. Fluvaquentic Haplaquolls						
132---------- Forbesville	Moderate: slope.	Slight---------	Deep to water	Percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
133---------- Forbesville	Severe: slope.	Slight---------	Deep to water	Percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
134*, 135*: Forward Variant--	Severe: seepage, slope.	Moderate: seepage.	Deep to water	Droughty, slope.	Slope----------	Slope, droughty.
Kidd----------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
136*, 137*:						
Freezeout	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Yollabolly	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
138*, 139*:						
Glenview	Severe: slope.	Severe: piping.	Deep to water	Slope	Slope	Slope.
Arrowhead	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
140*:						
Glenview	Moderate: depth to rock, slope.	Severe: piping.	Deep to water	Slope	Favorable	Favorable.
Bottlerock	Moderate: slope.	Slight	Deep to water	Droughty, percs slowly, slope.	Percs slowly	Droughty, percs slowly.
141*:						
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Montara	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
142*:						
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Montara	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Rock outcrop.						
143*:						
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Okiota	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
144--- Jafa	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Slope	Favorable	Favorable.
145--- Jafa	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
146*: Jafa loam	Severe: slope.	Moderate: piping.	Deep to water	Slope	Slope	Slope.
Jafa gravelly loam	Severe: slope.	Slight	Deep to water	Slope	Slope	Slope.
147 Kelsey	Severe: seepage.	Severe: piping.	Deep to water	Favorable	Favorable	Favorable.
148*, 149*: Kidd	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Forward	Severe: seepage, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
150 Kilaga Variant	Slight	Slight	Deep to water1/	Percs slowly	Favorable	Percs slowly.
151*: Konocti stony loam	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Konocti cobbly loam	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Benridge	Severe: slope.	Severe: hard to pack.	Deep to water	Slope	Slope	Slope.
152*, 153*: Konocti	Severe: seepage, slope.	Severe: piping.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hambright	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
154*: Konocti	Severe: seepage, slope.	Severe: piping.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hambright	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop.						
155*, 156*: Konocti Variant	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
155*, 156*: Konocti	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Hambright	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
157--- Landlow Variant	Slight	Severe: wetness.	Percs slowly, flooding.	Wetness, percs slowly, flooding.	Wetness	Wetness, percs slowly.
158--- Lupoyoma	Moderate: seepage.	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
159--- Manzanita	Moderate: slope.	Moderate: piping, hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly	Favorable.
160, 161--- Manzanita	Severe: slope.	Moderate: piping, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope.
162--- Manzanita	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly	Favorable.
163--- Manzanita	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope.
164--- Maxwell	Slight	Moderate: hard to pack, wetness.	Deep to water1/	Percs slowly	Percs slowly	Percs slowly.
165--- Maxwell	Moderate: slope.	Moderate: hard to pack, wetness.	Deep to water1/	Percs slowly, slope.	Percs slowly	Percs slowly.
166*, 167*: Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Etsel	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Mayacama	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
168*, 169*: Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Etsel	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Snook	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
170*:						
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Etsel	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
171*:						
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Hopland	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Etsel	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
172*, 173*, 174*:						
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Hopland	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Mayacama	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
175*:						
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Millsholm	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Bressa	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
176--- Maywood Variant	Moderate: seepage.	Severe: piping.	Deep to water	Droughty, erodes easily, flooding.	Erodes easily	Erodes easily, droughty.
177*:						
Millsholm	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Bressa	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
178*:						
Millsholm	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Bressa	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Hopland	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
179*:						
Millsholm	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Squawrock	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Pomo	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
180--- Mocho Variant	Slight	Moderate: piping.	Deep to water	Favorable	Favorable	Favorable.
181*, 182*:						
Neice	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
Sobrante	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Hambright	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
183*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Bamtush	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.
Deadwood	Severe: depth to rock, slope.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
184*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Deadwood	Severe: depth to rock, slope.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Bamtush	Severe: slope.	Slight	Deep to water	Droughty, slope.	Slope	Slope, droughty.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
185*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Decy	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
186*, 187*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
Deadwood	Severe: depth to rock, slope.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
188*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
189*, 190*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sheetiron	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Deadwood	Severe: depth to rock, slope.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
191*:						
Neuns	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
192*:						
Okiota	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
192*: Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
193*: Okiota	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
Henneke	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Dubakella	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
194--- Oxalis Variant	Slight	Severe: hard to pack.	Deep to water	Percs slowly, erodes easily.	Erodes easily, percs slowly.	Erodes easily, percs slowly.
195*, 196*, 197*: Phipps clay loam	Severe: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Phipps loam	Severe: slope.	Severe: piping.	Deep to water	Percs slowly, slope.	Slope	Slope, percs slowly.
198*: Pomo	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
Bressa	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
199*. Riverwash						
200*: Rock outcrop.						
Etsel	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Snook	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
201*, 202*: Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
Kekawaka	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
203---------- San Joaquin Variant	Severe: seepage, cemented pan.	Severe: piping.	Deep to water	Percs slowly, cemented pan.	Cemented pan, erodes easily, too sandy.	Erodes easily, cemented pan, percs slowly.
204*, 205*: Sheetiron--------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Deadwood---------	Severe: depth to rock, slope.	Severe: thin layer, seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
206*: Shortyork Variant	Severe: slope.	Moderate: thin layer.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
Yorkville--------	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Squawrock--------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
207*, 208*: Skyhigh----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Asbill----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, depth to rock, percs slowly.
209*: Skyhigh----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Millsholm--------	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
210*, 211*, 212*: Skyhigh----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, depth to rock, slope.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
Sleeper----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.
Millsholm--------	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
213*, 214*, 215*: Sleeper Variant--	Severe: slope.	Moderate: piping.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Sleeper----------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope, erodes easily.	Slope, erodes easily, percs slowly.	Slope, erodes easily, percs slowly.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
216*, 217*:						
Sobrante	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Collayomi	Severe: slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
217*, 218*:						
Whispering	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
218*, 219*:						
Sobrante	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Guenoc	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Hambright	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
220*:						
Sobrante	Severe: slope.	Severe: piping.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Hambright	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Guenoc	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
221, 222 Sodabay	Severe: slope.	Severe: thin layer.	Deep to water	Slope	Slope	Slope.
223*:						
Sodabay	Severe: slope.	Severe: thin layer.	Deep to water	Slope	Slope	Slope.
Konocti cobbly loam	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
Konocti stony loam	Severe: seepage, slope.	Severe: piping, large stones.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
224*:						
Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Marpa	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
225*, 226*: Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Marpa	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
227*: Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Millsholm	Severe: depth to rock, slope.	Severe: thin layer, piping.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, erodes easily, depth to rock.
228*: Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
229*: Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
Maymen	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
230*: Speaker	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Speaker Variant	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope, erodes easily.	Slope, depth to rock, erodes easily.	Slope, depth to rock, erodes easily.
Sanhedrin	Severe: slope.	Moderate: thin layer, piping.	Deep to water	Slope	Slope	Slope.
231*: Squawrock	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
231*: Shortyork Variant	Severe: slope.	Moderate: thin layer.	Deep to water	Droughty, percs slowly, depth to rock.	Slope, depth to rock, percs slowly.	Slope, droughty, depth to rock.
232---------- Still	Slight---------	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
233---------- Still	Moderate: seepage.	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
234---------- Still	Slight---------	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
235*: Still----------	Moderate: slope.	Severe: piping.	Deep to water	Slope----------	Favorable------	Favorable.
Talmage----------	Severe: seepage.	Severe: seepage.	Deep to water	Droughty, slope.	Too sandy------	Droughty.
236*: Stonyford--------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
Guenoc----------	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.
237---------- Talmage	Severe: seepage.	Severe: seepage.	Deep to water	Droughty-------	Too sandy------	Droughty.
238---------- Tulelake	Slight---------	Severe: hard to pack, ponding.	Ponding, percs slowly, flooding.	Ponding, percs slowly, erodes easily.	Erodes easily, ponding, percs slowly.	Wetness, erodes easily, percs slowly.
239---------- Tulelake	Slight---------	Severe: hard to pack, wetness.	Percs slowly---	Wetness, percs slowly, erodes easily.	Erodes easily, wetness, percs slowly.	Erodes easily, percs slowly.
240*: Tyson----------	Severe: slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Neuns----------	Severe: slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
241*: Vitrandepts. Cinder land.						
242---------- Wappo	Moderate: seepage, slope.	Moderate: piping.	Deep to water	Droughty, percs slowly, slope.	Erodes easily, percs slowly.	Erodes easily, droughty.
243---------- Wappo	Severe: slope.	Moderate: piping.	Deep to water	Droughty, percs slowly, slope.	Slope, erodes easily, percs slowly.	Slope, erodes easily, droughty.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
244---------- Wappo Variant	Moderate: slope.	Slight---------	Deep to water	Droughty, percs slowly, slope.	Favorable------	Droughty, percs slowly.
245*: Whispering-------	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, depth to rock.
Collayomi very gravelly loam---	Severe: slope.	Moderate: large stones.	Deep to water	Droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
Collayomi stony loam----------	Severe: slope.	Severe: large stones.	Deep to water	Large stones, droughty, slope.	Slope, large stones.	Large stones, slope, droughty.
246---------- Wolfcreek	Slight---------	Severe: piping.	Deep to water	Favorable------	Favorable------	Favorable.
247---------- Wolfcreek	Slight---------	Severe: piping.	Deep to water	Erodes easily	Erodes easily	Erodes easily.
248. Xerofluvents						
249*: Xerofluvents.						
Riverwash.						
250*: Yollabolly-------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Freezeout--------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
251*: Yollabolly-------	Severe: depth to rock, slope.	Severe: thin layer.	Deep to water	Droughty, depth to rock, slope.	Slope, depth to rock.	Slope, droughty, depth to rock.
Rock outcrop.						
Freezeout--------	Severe: seepage, slope.	Severe: seepage.	Deep to water	Droughty, depth to rock, slope.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
252*: Yorktree---------	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Hopland----------	Severe: slope.	Severe: thin layer.	Deep to water	Depth to rock, slope.	Slope, depth to rock.	Slope, depth to rock.

See footnotes at end of table.

TABLE 14.--WATER MANAGEMENT--Continued

Soil name and map symbol	Limitations for--		Features affecting--			
	Pond reservoir areas	Embankments, dikes, and levees	Drainage	Irrigation	Terraces and diversions	Grassed waterways
252*:						
Squawrock	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
253*:						
Yorkville	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Pomo	Severe: slope.	Moderate: thin layer.	Deep to water	Slope, erodes easily.	Slope, erodes easily.	Slope, erodes easily.
254*:						
Yorkville	Severe: slope.	Severe: hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Yorktree	Severe: slope.	Moderate: thin layer, hard to pack.	Deep to water	Percs slowly, slope.	Slope, percs slowly.	Slope, percs slowly.
Squawrock	Severe: slope.	Severe: thin layer.	Deep to water	Large stones, droughty, depth to rock.	Slope, large stones, depth to rock.	Large stones, slope, droughty.
255---------- Yorkville Variant	Moderate: slope.	Moderate: hard to pack.	Deep to water	Percs slowly, slope.	Percs slowly---	Percs slowly.

* See description of the map unit for composition and behavior characteristics of the map unit.
1/ If irrigated, consider other restrictive features for drainage.

TABLE 15.--ENGINEERING INDEX PROPERTIES

[The symbol < means less than; > means more than. Absence of an entry indicates that data were not estimated]

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
101*, 102*:											
Aiken	0-5	Loam	ML	A-4, A-5	0-5	95-100	80-100	65-75	50-60	25-45	NP-10
	5-20	Clay loam	ML	A-6, A-7	0-10	95-100	90-100	75-95	65-80	35-50	10-20
	20-61	Clay	ML, MH	A-7	0-10	95-100	95-100	90-95	75-85	45-60	15-25
	61-74	Cobbly clay	ML, MH	A-7	15-40	85-95	80-90	75-85	60-80	45-60	15-25
Sobrante	0-10	Loam	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	10-38	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-80	25-40	5-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
103, 104 Asbill	0-13	Clay loam	CL	A-7	0	100	100	90-100	75-85	40-50	20-25
	13-39	Silty clay, clay	CH	A-7	0	100	100	95-100	85-95	50-65	25-35
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
105*. Badland											
106*:											
Bally	0-16	Gravelly loam	GM-GC, GM, SM-SC, SM	A-4	0-5	60-80	55-75	50-65	35-50	25-35	5-10
	16-80	Very gravelly sandy clay, very gravelly clay, very gravelly clay loam.	GC	A-2, A-7	0-15	40-55	35-50	30-45	15-40	40-60	15-30
Phipps	0-3	Gravelly loam	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	3-61	Gravelly clay loam, gravelly clay.	CL, CH, GC	A-7	0	55-80	50-75	45-70	35-60	40-55	15-30
107*:											
Bally	0-10	Gravelly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-4, A-6, A-2	0-5	60-80	55-75	50-65	30-50	25-35	5-15
	10-18	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2	0-15	40-55	35-50	30-45	15-25	30-40	10-20
	18-37	Very gravelly sandy clay, very gravelly clay, very gravelly clay loam.	GC	A-2, A-7	0-15	40-55	35-50	30-45	15-40	40-60	15-30
	37-65	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2	0-15	30-45	25-40	20-35	15-25	30-40	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
107*:											
Phipps----------	0-6	Loam----------	CL-ML, ML	A-4	0	80-100	75-95	70-90	50-70	25-35	5-10
	6-21	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0	60-85	50-75	50-75	45-70	40-55	15-30
	21-41	Gravelly loam, gravelly sandy clay loam, gravelly clay loam.	CL-ML, CL, GM-GC, GC	A-2, A-6, A-4	0	55-80	50-75	40-70	30-60	25-40	5-15
	41-73	Very gravelly loam, very gravelly sandy clay loam, very gravelly clay loam.	GM-GC, GC	A-2	0-5	40-55	35-50	30-45	15-30	25-40	5-15
108*:											
Bally----------	0-10	Gravelly sandy clay loam.	GM-GC, GC, SM-SC, SC	A-4, A-6, A-2	0-5	60-80	55-75	50-65	30-50	25-35	5-15
	10-18	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2	0-15	40-55	35-50	30-45	15-25	30-40	10-20
	18-37	Very gravelly sandy clay, very gravelly clay, very gravelly clay loam.	GC	A-2, A-7	0-15	40-55	35-50	30-45	15-40	40-60	15-30
	37-65	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2	0-15	30-45	25-40	20-35	15-25	30-40	10-20
Phipps----------	0-6	Loam----------	CL-ML, ML	A-4	0	80-100	75-95	70-90	50-70	25-35	5-10
	6-21	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0	60-85	50-75	50-75	45-70	40-55	15-30
	21-41	Gravelly loam, gravelly sandy clay loam, gravelly clay loam.	CL-ML, CL, GM-GC, GC	A-2, A-6, A-4	0	55-80	50-75	40-70	30-60	25-40	5-15
	41-73	Very gravelly loam, very gravelly sandy clay loam, very gravelly clay loam.	GM-GC, GC	A-2	0-5	40-55	35-50	30-45	15-30	25-40	5-15
Haploxeralfs.											
109*:											
Bamtush----------	0-7	Gravelly loam----	GM, SM, SM-SC, GM-GC	A-4	0	60-80	55-75	50-65	35-50	25-35	5-10
	7-31	Very gravelly loam.	GM-GC, GC	A-2	0-5	30-55	25-50	20-45	15-35	25-35	5-15
	31-63	Very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
109*:											
Neuns	0-4	Gravelly loam	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
110*, 111*:											
Bamtush	0-7	Gravelly loam	GM, SM, SM-SC, GM-GC	A-4	0	60-80	55-75	50-65	35-50	25-35	5-10
	7-31	Very gravelly loam.	GM-GC, GC	A-2	0-5	30-55	25-50	20-45	15-35	25-35	5-15
	31-63	Very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-20
Speaker	0-8	Gravelly loam	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sanhedrin	0-8	Gravelly loam	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
112*, 113*:											
Benridge	0-6	Loam	ML	A-4	0	80-95	75-90	60-80	50-65	25-40	NP-10
	6-21	Clay loam, gravelly clay loam.	ML, GM	A-6, A-7	0-10	65-95	60-90	55-85	40-75	35-50	10-20
	21-63	Gravelly clay loam, gravelly clay.	MH, ML, GM	A-7	0-10	65-80	60-75	55-70	40-55	40-60	15-25
	63-68	Clay	MH, ML	A-7	0-10	85-100	75-90	70-85	65-80	45-60	15-25
Konocti cobbly loam	0-8	Cobbly loam	ML	A-4	15-30	75-95	70-90	60-80	50-65	25-35	NP-10
	8-16	Stony loam, stony clay loam.	ML, CL, GM,GC,	A-4, A-6	20-40	65-85	60-80	50-70	45-60	30-40	10-20
	16-32	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	32-39	Very stony sandy loam, very stony loam.	SM	A-2	40-50	75-95	70-90	40-65	25-35	20-30	NP-5
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
112*, 113*:											
Konocti stony loam----------	0-4	Stony loam-------	ML	A-4	5-20	75-95	70-90	60-80	50-65	25-35	NP-10
	4-9	Stony loam, stony clay loam.	ML, CL, GM, GC	A-4, A-6	20-40	65-85	60-80	50-70	45-60	30-40	5-15
	9-28	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
114*, 115*:											
Benridge--------	0-6	Loam------------	ML	A-4	0	80-95	75-90	60-80	50-65	25-40	NP-10
	6-21	Clay loam, gravelly clay loam.	ML, GM	A-6, A-7	0-10	65-95	60-90	55-85	40-75	35-50	10-20
	21-63	Gravelly clay loam, gravelly clay.	MH, ML, GM	A-7	0-10	65-80	60-75	55-70	40-55	40-60	15-25
	63-68	Clay------------	MH, ML	A-7	0-10	85-100	75-90	70-85	65-80	45-60	15-25
Sodabay---------	0-6	Loam------------	ML	A-4	0	80-100	75-95	70-85	50-65	25-35	NP-10
	6-26	Loam, clay loam	ML	A-4, A-6, A-7	0	90-100	85-95	75-90	50-75	30-45	5-15
	26-52	Clay loam--------	ML	A-7	0-5	80-100	75-95	70-85	50-70	40-50	10-20
	52-63	Gravelly clay loam, gravelly loam.	ML, SM	A-4, A-6, A-7	0	70-80	65-75	60-70	40-60	30-45	5-15
	63	Weathered bedrock	---	---	---	---	---	---	---	---	---
116----------	0-11	Loam------------	CL-ML, ML	A-4	0	85-100	80-95	70-90	50-70	25-35	5-10
Benridge Variant	11-24	Gravelly clay, gravelly clay loam.	CL, CH, GC, SC	A-7	0-15	65-90	50-75	45-75	35-60	40-60	15-35
	24	Weathered bedrock	---	---	---	---	---	---	---	---	---
117*, 118*:											
Bottlerock------	0-5	Extremely gravelly loam.	GP-GM	A-1	0	10-30	5-20	5-15	5-10	---	NP
	5-19	Very gravelly loam.	SM, GM	A-1, A-2	0	55-70	25-40	15-30	10-20	25-35	NP-10
	19-39	Very gravelly sandy clay loam, very gravelly clay loam.	SM, GC, SM, SC	A-2	0	50-80	25-50	15-40	10-30	30-45	5-20
	39-63	Very gravelly clay.	GC	A-2	0	50-85	25-50	25-45	20-35	45-60	20-35
Glenview--------	0-1	Very gravelly loam.	GM	A-1, A-2	0	25-55	25-50	15-40	10-35	25-35	NP-5
	1-6	Gravelly loam----	GM, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	NP-10
	6-15	Clay loam, clay	CL, ML, MH	A-6, A-7	0	80-100	75-95	70-90	55-75	30-55	10-20
	15-65	Gravelly clay loam, gravelly clay.	CL, ML, MH, GM	A-6, A-7	0	55-80	50-75	45-70	40-60	30-55	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
117*, 118*:											
Arrowhead-------	0-1	Extremely gravelly sandy loam.	GP	A-1	0	10-30	5-20	5-15	0-5	---	NP
	1-8	Gravelly sandy loam.	SM, GM	A-4, A-2	0	60-80	55-75	40-60	25-50	20-30	NP-5
	8-14	Gravelly sandy clay loam, gravelly clay loam, cobbly clay loam.	SM, GM	A-2, A-5, A-4	0-15	60-70	55-65	35-50	25-40	30-45	5-10
	14-31	Very stony clay, very cobbly clay.	GM	A-2	35-60	35-45	30-40	25-35	20-30	45-60	15-25
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
119*, 120*:											
Bressa----------	0-12	Loam-------------	CL-ML, ML	A-4	0	80-100	75-95	65-90	50-70	25-35	5-10
	12-26	Clay loam--------	CL	A-6	0	80-100	75-95	70-90	60-85	30-40	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Millsholm-------	0-3	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	3-11	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
121--------------	0-41	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
Clear Lake	41-56	Clay, silty clay	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
	56-72	Clay loam--------	CL	A-7	0	100	100	95-100	75-90	40-50	15-25
122--------------	0-38	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
Clear Lake	38-63	Clay-------------	CH, CL	A-7	0	100	100	95-100	85-95	40-70	20-40
Variant	63-72	Clay loam--------	CL	A-7	0	100	100	95-100	75-90	40-50	15-25
123--------------	0-6	Clay loam--------	CL	A-6	0	100	95-100	90-100	65-85	30-40	10-20
Cole	6-51	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-25
	51-62	Silty clay loam, clay loam, clay.	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-25
	62-70	Silty clay loam, clay loam, silty clay.	CL	A-6, A-7	0	100	100	90-100	70-95	35-50	15-25
124--------------	0-8	Clay loam--------	CL, ML	A-7	0	100	100	90-100	75-85	40-50	15-20
Cole Variant	8-60	Clay, clay loam	CL, CH	A-7	0	100	100	90-100	75-95	45-60	20-30
125--------------	0-20	Clay loam--------	CL, ML	A-7	0	100	100	90-100	75-85	40-50	15-20
Cole Variant	20-60	Clay, clay loam	CL, CH	A-7	0	100	100	90-100	75-95	45-60	20-30
126*:											
Collayomi very gravelly loam--	0-15	Very gravelly loam.	GM	A-1	0-15	25-45	25-40	20-30	15-20	25-35	NP-5
	15-60	Very gravelly loam, very gravelly clay loam, extremely gravelly loam.	GM, GC	A-2	10-20	25-45	20-40	15-30	10-20	30-40	5-15

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
126*:											
Collayomi stony loam----------	0-12	Stony loam-------	SM	A-4	15-40	75-85	70-80	60-70	40-50	25-35	NP-5
	12-60	Very cobbly clay loam, very cobbly loam, very stony loam.	GM, GC	A-2, A-4 A-6	30-50	55-65	50-60	45-55	30-45	30-40	5-15
127*, 128*:											
Collayomi-------	0-15	Very gravelly loam.	GM	A-1	0-15	25-45	25-40	20-30	15-20	25-35	NP-5
	15-60	Very gravelly loam, very gravelly clay loam, extremely gravelly loam.	GM, GC	A-2	10-20	25-45	20-40	15-30	10-20	30-40	5-15
Aiken----------	0-5	Loam-------------	ML	A-4, A-5	0-5	95-100	80-100	65-75	50-60	25-45	NP-10
	5-20	Clay loam--------	ML	A-6, A-7	0-10	95-100	90-100	75-95	65-80	35-50	10-20
	20-61	Clay-------------	ML, MH	A-7	0-10	95-100	95-100	90-95	75-85	45-60	15-25
	61-74	Cobbly clay------	ML, MH	A-7	15-40	85-95	80-90	75-85	60-80	45-60	15-25
Whispering------	0-5	Loam-------------	ML	A-4	0-15	80-95	75-90	65-85	50-60	25-35	NP-5
	5-15	Gravelly loam----	SM, GM	A-4, A-5	5-15	60-80	55-75	45-65	35-50	25-45	NP-10
	15-26	Very gravelly clay loam, very cobbly clay loam.	GM	A-2, A-4, A-7	10-50	40-60	35-55	30-50	25-45	30-50	5-15
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
129*:											
Collayomi-------	0-15	Very gravelly loam.	GM	A-1	0-15	25-45	25-40	20-30	15-20	25-35	NP-5
	15-60	Very gravelly loam, very gravelly clay loam, extremely gravelly loam.	GM, GC	A-2	10-20	25-45	20-40	15-30	10-20	30-40	5-15
Whispering------	0-5	Loam-------------	ML	A-4	0-15	80-95	75-90	65-85	50-60	25-35	NP-5
	5-15	Gravelly loam----	SM, GM	A-4, A-5	5-15	60-80	55-75	45-65	35-50	25-45	NP-10
	15-26	Very gravelly clay loam, very cobbly clay loam.	GM	A-2, A-4, A-7	10-50	40-60	35-55	30-50	25-45	30-50	5-15
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
130*:											
Deadwood--------	0-4	Very gravelly sandy loam.	GP-GM, GM	A-1	0-5	30-55	25-50	10-30	5-20	20-30	NP-5
	4-13	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-15	20-55	15-45	10-40	5-30	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
130*:											
Sheetiron-------	0-3	Gravelly sandy loam.	GM, SM	A-4	0-10	55-75	50-70	45-60	35-50	25-40	NP-10
	3-29	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GM	A-1, A-2	5-20	30-55	25-50	20-45	15-35	25-40	NP-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
131. Fluvaquentic Haplaquolls											
132, 133---------	0-16	Loam-------------	CL, CL-ML	A-4, A-6	0	80-100	75-95	65-85	50-65	20-40	5-15
Forbesville	16-30	Clay-------------	CL, CH	A-7	0	80-100	75-95	70-90	65-85	40-65	20-40
	30-70	Very gravelly clay, very gravelly clay loam.	GC	A-2, A-7	0	35-60	25-50	20-45	15-40	40-60	15-35
134*, 135*:											
Forward Variant-	0-7	Very gravelly loam.	GM	A-1, A-2	0-5	40-55	35-50	30-40	20-35	---	NP
	7-62	Very gravelly loam.	GM	A-1, A-2	0-5	40-55	35-50	30-40	20-35	25-35	NP-5
	62	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kidd------------	0-4	Gravelly loam----	GM, SM	A-4	0-5	55-80	50-75	40-60	35-50	25-35	NP-5
	4-13	Gravelly sandy loam, gravelly loam, gravelly fine sandy loam.	GM, SM	A-2, A-4	0-10	55-80	50-75	35-60	25-50	25-35	NP-5
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
136*, 137*:											
Freezeout-------	0-16	Very gravelly sandy loam.	GM	A-1	0-15	45-55	40-50	30-50	15-25	20-30	NP-5
	16-25	Extremely gravelly sandy loam, very gravelly loam, very gravelly sandy loam.	GM, GP-GM	A-1	0-30	25-55	20-50	15-35	5-20	20-30	NP-5
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Yollabolly------	0-5	Very gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	20-35	NP-10
	5-14	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	20-35	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
138*, 139*:											
Glenview--------	0-1	Very gravelly loam.	GM	A-1, A-2	0	25-55	25-50	15-40	10-35	25-35	NP-5
	1-6	Gravelly loam----	GM, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	NP-10
	6-15	Clay loam, clay	CL, ML, MH	A-6, A-7	0	80-100	75-95	70-90	55-75	30-55	10-20
	15-65	Gravelly clay loam, gravelly clay.	CL, ML, MH, GM	A-6, A-7	0	55-80	50-75	45-70	40-60	30-55	10-20
Arrowhead-------	0-1	Extremely gravelly sandy loam.	GP	A-1	0	10-30	5-20	5-15	0-5	---	NP
	1-8	Gravelly sandy loam.	SM, GM	A-4, A-2	0	60-80	55-75	40-60	25-50	20-30	NP-5
	8-14	Gravelly sandy clay loam, gravelly clay loam, cobbly clay loam.	SM, GM	A-2, A-5, A-4	0-15	60-70	55-65	35-50	25-40	30-45	5-10
	14-31	Very stony clay, very cobbly clay.	GM	A-2	35-60	35-45	30-40	25-35	20-30	45-60	15-25
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
140*:											
Glenview--------	0-1	Very gravelly loam.	GM	A-1, A-2	0	25-55	25-50	15-40	10-35	25-35	NP-5
	1-6	Gravelly loam----	GM, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	NP-10
	6-15	Clay loam, clay	CL, ML, MH	A-6, A-7	0	80-100	75-95	70-90	55-75	30-55	10-20
	15-65	Gravelly clay loam, gravelly clay.	CL, ML, MH, GM	A-6, A-7	0	55-80	50-75	45-70	40-60	30-55	10-20
Bottlerock------	0-5	Extremely gravelly loam.	GP-GM	A-1	0	10-30	5-20	5-15	5-10	---	NP
	5-19	Very gravelly loam.	SM, GM	A-1, A-2	0	55-70	25-40	15-30	10-20	25-35	NP-10
	19-39	Very gravelly sandy clay loam, very gravelly clay loam.	SM, GC, SM, SC	A-2	0	50-80	25-50	15-40	10-30	30-45	5-20
	39-63	Very gravelly clay.	GC	A-2	0	50-85	25-50	25-45	20-35	45-60	20-35
141*:											
Henneke---------	0-3	Gravelly loam----	GM-GC, SM-SC, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	3-11	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	11-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Montara---------	0-12	Clay loam--------	CL	A-6, A-7	0-5	90-100	75-95	75-90	70-80	30-45	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
142*:											
Henneke---------	0-3	Gravelly loam----	GM-GC, SM-SC, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	3-11	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	11-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Montara---------	0-12	Clay loam--------	CL	A-6, A-7	0-5	90-100	75-95	75-90	70-80	30-45	10-20
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
143*:											
Henneke---------	0-3	Gravelly loam----	GM-GC, SM-SC, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	3-11	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	11-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Okiota----------	0-1	Very gravelly clay loam.	GC	A-2, A-6	0-15	40-55	35-50	30-45	25-40	30-40	10-20
	1-3	Clay loam--------	CL	A-6	0-5	90-100	85-95	80-90	65-75	30-40	10-20
	3-14	Clay-------------	CL, CH	A-7	0-5	90-100	85-100	80-100	70-90	40-60	20-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
144, 145--------- Jafa	0-16	Loam-------------	CL-ML, ML	A-4	0	80-100	75-95	65-85	50-65	25-35	5-10
	16-68	Gravelly clay loam, gravelly sandy clay loam, clay loam.	CL, GC	A-6	0-15	60-90	55-85	50-80	35-65	30-40	10-20
146*:											
Jafa loam-------	0-13	Loam-------------	CL-ML, ML	A-4	0	80-100	75-95	65-85	50-65	25-35	5-10
	13-25	Gravelly loam----	GM-GC, GC, SC, SM-SC	A-4, A-6	0	55-80	50-75	45-65	35-50	25-35	5-15
	25-85	Gravelly clay loam, gravelly sandy clay loam, clay loam.	CL, GC	A-6	0-15	60-90	55-85	50-80	35-65	30-40	10-20
Jafa gravelly loam-----------	0-17	Gravelly loam----	GM-GC, GM SM-SC, SM	A-4	0	60-80	55-75	50-65	35-50	25-35	5-10
	17-24	Gravelly loam----	GM-GC, GC SM-SC, SC	A-4, A-6	0-10	60-80	55-75	50-65	35-50	25-35	5-15
	24-39	Gravelly sandy clay loam, gravelly clay loam.	GC, SC	A-6	5-15	60-80	55-75	50-65	35-50	30-40	10-20
	39-89	Very gravelly sandy clay loam, very gravelly clay loam.	GC	A-2, A-6	10-20	50-60	45-55	35-50	25-45	30-40	10-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
147----------	0-11	Fine sandy loam	SM	A-4	0	80-100	75-85	65-85	35-50	20-30	NP-5
Kelsey	11-60	Stratified gravelly sandy loam to loam.	SM	A-2, A-4	0	80-100	75-90	55-85	25-50	20-30	NP-5
148*, 149*:											
Kidd----------	0-9	Gravelly loam----	GM, SM	A-4	0-5	55-80	50-75	40-60	35-50	25-35	NP-5
	9-16	Gravelly sandy loam, gravelly loam, gravelly fine sandy loam.	GM, SM	A-2, A-4	0-10	55-80	50-75	35-60	25-50	25-35	NP-5
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Forward---------	0-9	Loam----------	ML	A-4	0	80-95	75-95	60-85	50-60	20-30	NP-5
	9-25	Gravelly sandy loam, gravelly loam.	GM, SM	A-2, A-4	0-5	55-80	50-75	40-60	25-50	20-30	NP-5
	25	Weathered bedrock	---	---	---	---	---	---	---	---	---
150----------	0-10	Loam----------	CL, CL-ML	A-4, A-6	0	95-100	85-100	75-95	60-75	25-35	5-15
Kilaga Variant	10-42	Clay loam--------	CL	A-7	0	95-100	85-100	80-95	65-80	40-50	20-25
	42-71	Silty clay, clay	CH	A-7	0	95-100	85-100	80-100	70-90	50-60	25-35
151*:											
Konocti stony loam----------	0-4	Stony loam-------	ML	A-4	5-20	75-95	70-90	60-80	50-65	25-35	NP-10
	4-9	Stony loam, stony clay loam.	ML, CL GM, GC	A-4, A-6	20-40	65-85	60-80	50-70	45-60	30-40	5-15
	9-28	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Konocti cobbly loam----------	0-8	Cobbly loam------	ML	A-4	15-30	75-95	70-90	60-80	50-65	25-35	NP-10
	8-16	Stony loam, stony clay loam.	ML, CL, GM, GC	A-4, A-6	20-40	65-85	60-80	50-70	45-60	30-40	5-15
	16-32	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	32-39	Very stony sandy loam, very stony loam.	SM	A-2	40-50	75-95	70-90	40-65	25-35	20-30	NP-5
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Benridge--------	0-6	Loam----------	ML	A-4	0	80-95	75-90	60-80	50-65	25-40	NP-10
	6-21	Clay loam, gravelly clay loam.	ML, GM	A-6, A-7	0-10	65-95	60-90	55-85	40-75	35-50	10-20
	21-63	Gravelly clay loam, gravelly clay.	MH, ML, GM	A-7	0-10	65-80	60-75	55-70	40-55	40-60	15-25
	63-68	Clay----------	MH, ML	A-7	0-10	85-100	75-90	70-85	65-80	45-60	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
152*, 153*:											
Konocti---------	0-10	Gravelly loam----	SM, GM	A-4	0-5	65-80	60-75	50-65	40-50	25-35	NP-10
	10-29	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hambright-------	0-4	Very gravelly loam.	GM	A-1, A-2	0-10	35-55	30-50	25-45	20-35	25-35	NP-10
	4-16	Very gravelly loam, very gravelly silt loam.	GM-GC, GC	A-2, A-4, A-6	0-10	35-55	30-50	25-45	20-45	25-40	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
154*:											
Konocti---------	0-10	Gravelly loam----	SM, GM	A-4	0-5	65-80	60-75	50-65	40-50	25-35	NP-10
	10-29	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hambright-------	0-4	Very gravelly loam.	GM	A-1, A-2	0-10	35-55	30-50	25-45	20-35	25-35	NP-10
	4-16	Very gravelly loam, very gravelly silt loam.	GM-GC, GC	A-2, A-4, A-6	0-10	35-55	30-50	25-45	20-45	25-40	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
155*, 156*:											
Konocti Variant-	0-4	Gravelly loam----	SM, SM-SC, GM, GM-GC	A-4	0-10	60-85	55-75	45-70	35-50	25-35	5-10
	4-11	Very gravelly loam, very cobbly loam.	GM, GM-GC	A-2	15-30	45-65	40-60	30-50	20-35	25-35	5-10
	11-22	Very gravelly clay loam, very cobbly clay loam.	GC	A-2, A-6	15-30	45-65	40-60	35-55	25-50	30-40	10-20
	22-53	Very cobbly clay loam, very stony clay loam.	GC	A-6	20-50	55-70	50-65	45-60	35-50	30-40	10-20
	53	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Konocti---------	0-11	Cobbly loam------	ML	A-4	15-30	75-95	70-90	60-80	50-65	25-35	NP-10
	11-28	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
155*, 156*:											
Hambright-------	0-4	Very gravelly loam.	GM	A-1, A-2	0-10	35-55	30-50	25-45	20-35	25-35	NP-10
	4-16	Very gravelly loam, very gravelly silt loam.	GM-GC, GC	A-2, A-4, A-6	0-10	35-55	30-50	25-45	20-45	25-40	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
157----------	0-7	Silty clay loam	ML	A-7, A-6	0	100	100	95-100	85-95	35-50	10-20
Landlow Variant	7-23	Silty clay, clay	CH	A-7	0	100	100	90-100	75-95	50-65	25-35
	23-84	Silty clay loam, silty clay, clay.	CL, CH	A-7	0	100	100	90-100	75-95	40-65	15-35
158----------	0-31	Silt loam--------	ML	A-4	0	100	100	95-100	75-90	20-40	NP-10
Lupoyoma	31-84	Stratified very fine sandy loam to silty clay loam.	ML, CL-ML	A-4, A-6, A-7	0	100	100	95-100	75-95	25-45	5-15
159, 160, 161----	0-19	Loam----------	CL, CL-ML	A-4, A-6	0	100	75-100	65-95	50-75	25-35	5-15
Manzanita	19-43	Sandy clay loam, clay loam.	SC, CL	A-6	0	100	75-100	60-100	35-80	30-40	10-20
	43-84	Clay loam, clay	CL, CH	A-7	0	100	75-100	70-100	55-90	40-55	15-30
162, 163---------	0-7	Gravelly loam----	SM-SC, SC, GM-GC, GC	A-4, A-6	0	65-85	50-75	40-65	35-50	25-35	5-15
Manzanita	7-35	Gravelly sandy clay loam, gravelly clay loam, gravelly loam.	GC, CL, SC	A-6	0	65-85	50-75	40-70	35-60	30-40	10-20
	35-60	Gravelly clay loam, gravelly clay.	SC, CL, CH	A-7	0	85-95	50-75	45-75	35-65	40-55	15-30
164, 165---------	0-6	Clay loam--------	CL	A-7	0	100	100	90-100	70-80	40-50	15-25
Maxwell	6-84	Clay, silty clay	CH	A-7	0	100	100	90-100	75-95	50-60	25-35
166*, 167*:											
Maymen----------	0-12	Gravelly loam----	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Etsel----------	0-3	Gravelly loam----	SM-SC, GM-GC	A-2, A-4	0-5	55-80	50-75	40-70	25-50	20-30	5-10
	3-10	Very gravelly loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Mayacama--------	0-5	Very gravelly sandy loam.	GM	A-1, A-2	5-15	40-60	35-55	20-40	15-25	20-35	NP-10
	5-31	Very gravelly loam, very gravelly sandy loam, very gravelly sandy clay loam.	GC, GM-GC	A-2	5-30	40-55	35-50	20-45	15-35	25-35	5-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
168*:											
Maymen	0-12	Gravelly loam	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Etsel	0-3	Very gravelly loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	3-8	Very gravelly loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Snook	0-5	Loam	ML	A-4	0	80-100	75-95	65-85	50-70	20-35	NP-10
	5	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
169*:											
Maymen	0-12	Gravelly loam	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Etsel	0-3	Gravelly loam	SM-SC, GM-GC	A-2, A-4	0-5	55-80	50-75	40-70	25-50	20-30	5-10
	3-8	Very gravelly loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Snook	0-5	Loam	ML	A-4	0	80-100	75-95	65-85	50-70	20-35	NP-10
	5	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
170*:											
Maymen	0-12	Gravelly loam	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Etsel	0-3	Gravelly loam	SM-SC, GM-GC	A-2, A-4	0-5	55-80	50-75	40-70	25-50	20-30	5-10
	3-10	Very gravelly loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Speaker	0-8	Gravelly loam	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
171*:											
Maymen	0-12	Gravelly loam	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hopland	0-6	Loam	CL-ML, ML	A-4	0	85-100	80-100	65-90	50-70	25-35	5-10
	6-34	Clay loam, loam	CL	A-6	0	80-95	75-90	65-85	50-65	30-40	10-20
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
171*:											
Etsel----------	0-3	Gravelly loam----	SM-SC, GM-GC	A-2, A-4	0-5	55-80	50-75	40-70	25-50	20-30	5-10
	3-10	Very gravelly loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
172*, 173*, 174*:											
Maymen----------	0-12	Gravelly loam----	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hopland---------	0-6	Loam----------	CL-ML, ML	A-4	0	85-100	80-100	65-90	50-70	25-35	5-10
	6-34	Clay loam, loam	CL	A-6	0	80-95	75-90	65-85	50-65	30-40	10-20
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Mayacama--------	0-5	Very gravelly sandy loam.	GM	A-1, A-2	5-15	40-60	35-55	20-40	15-25	20-35	NP-10
	5-31	Very gravelly loam, very gravelly sandy loam, very gravelly sandy clay loam.	GC, GM-GC	A-2	5-30	40-55	35-50	20-45	15-35	25-35	5-15
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
175*:											
Maymen----------	0-12	Gravelly loam----	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Millsholm-------	0-3	Loam----------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	3-11	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bressa----------	0-12	Loam----------	CL-ML, ML	A-4	0	80-100	75-95	65-90	50-70	25-35	5-10
	12-26	Clay loam--------	CL	A-6	0	80-100	75-95	70-90	60-85	30-40	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
176----------	0-10	Sandy loam-------	SM	A-2, A-4	0	90-100	85-95	55-70	25-40	20-30	NP-5
Maywood Variant	10-64	Stratified sandy loam to silt loam.	SM	A-2, A-4	0	90-100	85-95	50-85	25-50	20-30	NP-5
177*:											
Millsholm-------	0-3	Loam----------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	3-11	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bressa----------	0-12	Loam----------	CL-ML, ML	A-4	0	80-100	75-95	65-90	50-70	25-35	5-10
	12-26	Clay loam--------	CL	A-6	0	80-100	75-95	70-90	60-85	30-40	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
178*:											
Millsholm-------	0-3	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	3-11	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bressa----------	0-12	Loam-------------	CL-ML, ML	A-4	0	80-100	75-95	65-90	50-70	25-35	5-10
	12-26	Clay loam--------	CL	A-6	0	80-100	75-95	70-90	60-85	30-40	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hopland---------	0-6	Loam-------------	CL-ML, ML	A-4	0	85-100	80-100	65-90	50-70	25-35	5-10
	6-34	Clay loam, loam	CL	A-6	0	80-95	75-90	65-85	50-65	30-40	10-20
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
179*:											
Millsholm-------	0-3	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	3-11	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	11	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Squawrock-------	0-8	Gravelly loam----	GM, SM	A-2, A-4, A-1	0-5	55-80	50-75	35-60	20-50	20-35	NP-10
	8-37	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-15
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Pomo------------	0-11	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	75-85	50-70	25-35	5-10
	11-40	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-5	55-80	50-75	45-70	35-60	30-40	10-20
	40-58	Gravelly clay, very gravelly clay loam, extremely gravelly clay loam.	GC	A-2, A-7	0-5	25-75	20-70	20-65	15-50	40-60	15-30
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
180--------------	0-6	Loam-------------	ML	A-4	0	85-100	85-100	70-90	50-65	20-35	NP-10
Mocho Variant	6-40	Stratified clay loam to sandy clay loam.	CL, SC	A-6	0	85-100	85-100	70-100	35-70	30-40	10-20
	40-70	Stratified sandy clay loam to extremely gravelly sandy clay loam.	GC, SC	A-6, A-2	0	60-80	50-75	40-70	25-50	30-40	10-20
181*, 182*:											
Neice-----------	0-11	Gravelly loam----	GM, SM	A-2, A-4	0	55-80	50-75	40-70	25-50	25-35	NP-10
	11-20	Gravelly clay loam.	GC, CL	A-6	0	55-80	50-75	50-70	35-60	30-40	10-20
	20-70	Very gravelly clay, very gravelly clay loam.	GC	A-2, A-7	0	30-60	25-50	20-50	15-50	40-50	15-25

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
181*, 182*:											
Sobrante--------	0-10	Loam----------	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	10-38	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-80	25-40	5-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hambright-------	0-4	Very gravelly loam.	GM	A-1, A-2	0-10	35-55	30-50	25-45	20-35	25-35	NP-10
	4-16	Very gravelly loam, very gravelly silt loam.	GM-GC, GC	A-2, A-4, A-6	0-10	35-55	30-50	25-45	20-45	25-40	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
183*:											
Neuns-----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bamtush---------	0-7	Gravelly loam----	GM, SM, SM-SC, GM-GC	A-4	0	60-80	55-75	50-65	35-50	25-35	5-10
	7-31	Very gravelly loam.	GM-GC, GC	A-2	0-5	30-55	25-50	20-45	15-35	25-35	5-15
	31-63	Very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-20
Deadwood--------	0-4	Very gravelly sandy loam.	GP-GM, GM	A-1	0-5	30-55	25-50	10-30	5-20	20-30	NP-5
	4-13	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-15	20-55	15-45	10-40	5-30	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
184*:											
Neuns-----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Deadwood--------	0-4	Very gravelly sandy loam.	GP-GM, GM	A-1	0-5	30-55	25-50	10-30	5-20	20-30	NP-5
	4-13	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-15	20-55	15-45	10-40	5-30	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
184*:											
Bamtush---------	0-7	Gravelly loam----	GM, SM, SM-SC, GM-GC	A-4	0	60-80	55-75	50-65	35-50	25-35	5-10
	7-31	Very gravelly loam.	GM-GC, GC	A-2	0-5	30-55	25-50	20-45	15-35	25-35	5-15
	31-63	Very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-20
185*:											
Neuns-----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Decy------------	0-8	Gravelly sandy loam.	SM, GM	A-2, A-4	0	60-80	55-75	40-55	25-40	20-30	NP-5
	8-15	Gravelly sandy loam, gravelly sandy clay loam, gravelly loam.	GM, SM	A-2, A-4	0-10	60-80	55-75	40-60	25-50	25-35	NP-10
	15-24	Very gravelly sandy loam, very gravelly sandy clay loam, very gravelly loam.	GM	A-2	0-15	45-60	40-55	30-45	15-25	25-35	NP-10
	24	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sanhedrin--------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
186*, 187*:											
Neuns-----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sanhedrin--------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
186*, 187*:											
Deadwood--------	0-4	Very gravelly sandy loam.	GP-GM, GM	A-1	0-5	30-55	25-50	10-30	5-20	20-30	NP-5
	4-13	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-15	20-55	15-45	10-40	5-30	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
188*:											
Neuns-----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sanhedrin-------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Speaker---------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
189*, 190*:											
Neuns-----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sheetiron-------	0-3	Gravelly sandy loam.	GM, SM	A-4	0-10	55-75	50-70	45-60	35-50	25-40	NP-10
	3-29	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GM	A-1, A-2	5-20	30-55	25-50	20-45	15-35	25-40	NP-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Deadwood--------	0-4	Very gravelly sandy loam.	GP-GM, GM	A-1	0-5	30-55	25-50	10-30	5-20	20-30	NP-5
	4-13	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-15	20-55	15-45	10-40	5-30	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
191*:											
Neuns----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Speaker---------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
192*:											
Okiota----------	0-1	Very gravelly clay loam.	GC	A-2, A-6	0-15	40-55	35-50	30-45	25-40	30-40	10-20
	1-3	Clay loam--------	CL	A-6	0-5	90-100	85-95	80-90	65-75	30-40	10-20
	3-14	Clay-------------	CL, CH	A-7	0-5	90-100	85-100	80-100	70-90	40-60	20-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Henneke---------	0-3	Gravelly loam----	GM-GC, SM-SC, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	3-11	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	11-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
193*:											
Okiota----------	0-1	Very gravelly clay loam.	GC	A-2, A-6	0-15	40-55	35-50	30-45	25-40	30-40	10-20
	1-3	Clay loam--------	CL	A-6	0-5	90-100	85-95	80-90	65-75	30-40	10-20
	3-14	Clay-------------	CL, CH	A-7	0-5	90-100	85-100	80-100	70-90	40-60	20-35
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Henneke---------	0-3	Gravelly loam----	GM-GC, SM-SC, GC, SC	A-4, A-6	0-5	55-75	50-70	45-65	35-50	20-40	5-20
	3-11	Gravelly clay loam.	GC, CL	A-6, A-7	0-5	55-75	50-70	45-65	35-55	35-45	15-25
	11-19	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	5-30	50-60	30-50	25-50	20-40	40-60	15-30
	19	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Dubakella-------	0-7	Very gravelly loam.	GM-GC, GM	A-2	5-10	40-55	35-50	30-45	25-35	25-35	5-10
	7-30	Very gravelly clay loam, very gravelly clay, very cobbly clay.	GC, SC	A-7	10-30	50-75	35-60	35-60	35-50	40-55	15-30
	30	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
194----------	0-8	Silt loam--------	ML	A-4	0	100	100	90-100	70-90	25-40	NP-10
Oxalis Variant	8-17	Silty clay loam, silty clay.	CL, MH, ML	A-7	0	100	100	95-100	85-95	40-55	15-25
	17-70	Silty clay-------	MH, CH	A-7	0	100	100	95-100	90-95	50-60	20-30
	70-84	Silt loam, sandy clay loam, silty clay loam.	ML, CL-ML	A-4, A-6, A-7	0	100	100	90-100	50-90	25-45	5-15
195*, 196*, 197*:											
Phipps clay loam	0-7	Clay loam--------	CL	A-6	0	90-100	85-100	80-95	65-75	30-40	10-15
	7-42	Clay loam, clay	CL, CH	A-7	0	80-100	75-100	70-95	60-90	40-55	15-30
	42-60	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	55-75	30-40	10-20
Phipps loam-----	0-6	Loam-------------	CL-ML, ML	A-4	0	80-100	75-95	70-90	50-70	25-35	5-10
	6-21	Gravelly clay loam, gravelly clay.	GC, CH, CL	A-7	0	60-85	50-75	50-75	45-70	40-55	15-30
	21-41	Gravelly loam, gravelly sandy clay loam, gravelly clay loam.	CL-ML, CL, GM-GC, GC	A-2, A-6, A-4	0	55-80	50-75	40-70	30-60	25-40	5-15
	41-73	Very gravelly loam, very gravelly sandy clay loam, very gravelly clay loam.	GM-GC, GC	A-2	0-5	40-55	35-50	30-45	15-30	25-40	5-15
198*:											
Pomo----------	0-11	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	75-85	50-70	25-35	5-10
	11-40	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-5	55-80	50-75	45-70	35-60	30-40	10-20
	40-58	Gravelly clay, very gravelly clay loam, extremely gravelly clay loam.	GC	A-2, A-7	0-5	25-75	20-70	20-65	15-50	40-60	15-30
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Bressa----------	0-12	Loam-------------	CL-ML, ML	A-4	0	80-100	75-95	65-90	50-70	25-35	5-10
	12-26	Clay loam--------	CL	A-6	0	80-100	75-95	70-90	60-85	30-40	10-20
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
199*. Riverwash											
200*: Rock outcrop.											
Etsel----------	0-3	Gravelly loam----	SM-SC, GM-GC	A-2, A-4	0-5	55-80	50-75	40-70	25-50	20-30	5-10
	3-8	Very gravelly loam, very gravelly sandy loam.	GM-GC	A-1, A-2	0-5	35-55	30-50	20-45	15-35	20-30	5-10
	8	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
200*:											
Snook----------	0-5	Loam----------	ML	A-4	0	80-100	75-95	65-85	50-70	20-35	NP-10
	5	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
201*, 202*:											
Sanhedrin-------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Kekawaka--------	0-9	Loam----------	ML	A-4	0	80-95	75-95	65-80	50-65	25-35	NP-10
	9-28	Clay loam--------	ML	A-6, A-7	0	80-95	75-95	70-90	55-70	35-50	10-20
	28-42	Clay----------	CL, CH	A-7	0	80-95	75-95	70-90	65-85	45-60	20-30
	42-68	Gravelly clay----	GC, CL, CH	A-7	0	55-80	50-75	45-70	40-65	45-60	20-30
	68	Weathered bedrock	---	---	---	---	---	---	---	---	---
Speaker---------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
203----------	0-21	Fine sandy loam	SM	A-4	0	100	95-100	70-85	35-50	20-30	NP-5
San Joaquin Variant	21-25	Clay loam, clay	CL, CH	A-7	0	100	95-100	90-100	75-95	40-55	15-30
	25-30	Indurated--------	---	---	---	---	---	---	---	---	---
	30-65	Stratified loamy sand to clay loam.	SM, ML	A-4	0	100	95-100	50-75	35-55	20-30	NP-5
204*, 205*:											
Sheetiron-------	0-3	Gravelly sandy loam.	GM, SM	A-4	0-10	55-75	50-70	45-60	35-50	25-40	NP-10
	3-29	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GM	A-1, A-2	5-20	30-55	25-50	20-45	15-35	25-40	NP-10
	29	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Deadwood--------	0-4	Very gravelly sandy loam.	GP-GM, GM	A-1	0-5	30-55	25-50	10-30	5-20	20-30	NP-5
	4-13	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-15	20-55	15-45	10-40	5-30	25-35	NP-10
	13	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
206*:											
Shortyork Variant--------	0-9	Gravelly loam----	SM, GM, SM-SC, GM-GC	A-4	0-5	55-80	50-75	45-60	35-50	25-35	5-10
	9-32	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	0-10	30-55	25-50	20-45	15-40	40-55	15-30
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Yorkville--------	0-3	Clay loam--------	CL	A-6, A-7	0	100	95-100	90-95	70-85	30-45	10-20
	3-33	Clay loam, clay	MH, CH	A-7	0	100	100	90-100	75-95	50-60	20-30
	33-64	Gravelly clay loam, gravelly clay, clay loam.	MH, CH	A-7	0	70-90	60-80	55-75	50-70	50-60	20-30
	64	Weathered bedrock	---	---	---	---	---	---	---	---	---
Squawrock--------	0-8	Gravelly loam----	GM, SM	A-2, A-4, A-1	0-5	55-80	50-75	35-60	20-50	20-35	NP-10
	8-37	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-15
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
207*, 208*:											
Skyhigh----------	0-2	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	65-85	50-65	25-35	5-10
	2-8	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	55-75	30-40	10-20
	8-38	Clay, clay loam	CL, CH	A-7	0	80-100	75-100	70-95	65-85	40-60	20-35
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Asbill-----------	0-13	Clay loam--------	CL	A-7	0	100	100	90-100	75-85	40-50	20-25
	13-39	Silty clay, clay	CH	A-7	0	100	100	95-100	85-95	50-65	25-35
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
209*:											
Skyhigh----------	0-2	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	65-85	50-65	25-35	5-10
	2-8	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	55-75	30-40	10-20
	8-38	Clay, clay loam	CL, CH	A-7	0	80-100	75-100	70-95	65-85	40-60	20-35
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Millsholm--------	0-6	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	6-16	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
210*:											
Skyhigh----------	0-2	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	65-85	50-65	25-35	5-10
	2-8	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	55-75	30-40	10-20
	8-38	Clay, clay loam	CL, CH	A-7	0	80-100	75-100	70-95	65-85	40-60	20-35
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sleeper----------	0-12	Loam-------------	CL-ML, ML	A-4	0	95-100	95-100	85-95	60-75	25-35	5-10
	12-45	Clay loam, clay	CL, CH	A-7	0	95-100	95-100	90-100	75-95	45-65	20-35
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
210*:											
Millsholm-------	0-6	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	6-16	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
211*, 212*:											
Skyhigh---------	0-2	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	65-85	50-65	25-35	5-10
	2-8	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	55-75	30-40	10-20
	8-38	Clay, clay loam	CL, CH	A-7	0	80-100	75-100	70-95	65-85	40-60	20-35
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sleeper---------	0-4	Loam-------------	CL-ML, ML	A-4	0	95-100	95-100	85-95	60-75	25-35	5-10
	4-48	Clay loam, clay	CL, CH	A-7	0	95-100	95-100	90-100	75-95	45-65	20-35
	48	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Millsholm-------	0-9	Loam-------------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	9-18	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
213*, 214*, 215*:											
Sleeper Variant-	0-12	Loam-------------	ML, CL-ML	A-4	0	95-100	85-100	75-85	50-55	25-35	5-10
	12-37	Clay loam--------	CL	A-6	0	85-100	75-100	70-100	50-80	30-40	10-20
	37-56	Clay, clay loam	CL, CH	A-7	0	85-100	75-100	70-100	55-95	40-60	20-35
	56-75	Clay loam--------	CL	A-6, A-7	0	85-100	75-100	70-100	50-80	35-50	15-25
	75	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sleeper---------	0-12	Loam-------------	CL-ML, ML	A-4	0	95-100	95-100	85-95	60-75	25-35	5-10
	12-45	Clay loam, clay	CL, CH	A-7	0	95-100	95-100	90-100	75-95	45-65	20-35
	45	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
216*, 217*:											
Sobrante--------	0-10	Loam-------------	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	10-38	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-80	25-40	5-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Collayomi-------	0-15	Very gravelly loam.	GM	A-1	0-15	25-45	25-40	20-30	15-20	25-35	NP-5
	15-60	Very gravelly loam, very gravelly clay loam, extremely gravelly loam.	GM, GC	A-2	10-20	25-45	20-40	15-30	10-20	30-40	5-15
Whispering------	0-5	Loam-------------	ML	A-4	0-15	80-95	75-90	65-85	50-60	25-35	NP-5
	5-15	Gravelly loam----	SM, GM	A-4, A-5	5-15	60-80	55-75	45-65	35-50	25-45	NP-10
	15-26	Very gravelly clay loam, very cobbly clay loam.	GM	A-2, A-4, A-7	10-50	40-60	35-55	30-50	25-45	30-50	5-15
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
218*, 219*:											
Sobrante--------	0-10	Loam-------------	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	10-38	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-80	25-40	5-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
218*, 219*:											
Guenoc----------	0-11	Clay loam--------	CL	A-6	0-5	80-100	75-95	70-90	50-75	30-40	10-15
	11-36	Clay, silty clay loam, clay loam.	CL	A-6, A-7	0-5	80-100	75-95	70-90	60-85	35-50	15-25
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hambright-------	0-4	Very gravelly loam.	GM	A-1, A-2	0-10	35-55	30-50	25-45	20-35	25-35	NP-10
	4-16	Very gravelly loam, very gravelly silt loam.	GM-GC, GC	A-2, A-4, A-6	0-10	35-55	30-50	25-45	20-45	25-40	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
220*:											
Sobrante--------	0-10	Loam-------------	ML	A-4	0	95-100	75-90	70-85	55-70	25-40	NP-10
	10-38	Loam, clay loam	CL, CL-ML	A-6, A-4	0-5	95-100	75-90	70-90	55-80	25-40	5-20
	38	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hambright-------	0-4	Very gravelly loam.	GM	A-1, A-2	0-10	35-55	30-50	25-45	20-35	25-35	NP-10
	4-16	Very gravelly loam, very gravelly silt loam.	GM-GC, GC	A-2, A-4, A-6	0-10	35-55	30-50	25-45	20-45	25-40	5-15
	16	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Guenoc----------	0-11	Clay loam--------	CL	A-6	0-5	80-100	75-95	70-90	50-75	30-40	10-15
	11-36	Clay, silty clay loam, clay loam.	CL	A-6, A-7	0-5	80-100	75-95	70-90	60-85	35-50	15-25
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
221, 222-------- Sodabay	0-6	Loam-------------	ML	A-4	0	80-100	75-95	70-85	50-65	25-35	NP-10
	6-26	Loam, clay loam	ML	A-4, A-6, A-7	0	90-100	85-95	75-90	50-75	30-45	5-15
	26-52	Clay loam--------	ML	A-7	0-5	80-100	75-95	70-85	50-70	40-50	10-20
	52-63	Gravelly clay loam, gravelly loam.	ML, SM	A-4, A-6, A-7	0	70-80	65-75	60-70	40-60	30-45	5-15
	63	Weathered bedrock	---	---	---	---	---	---	---	---	---
223*:											
Sodabay---------	0-6	Loam-------------	ML	A-4	0	80-100	75-95	70-85	50-65	25-35	NP-10
	6-26	Loam, clay loam	ML	A-4, A-6, A-7	0	90-100	85-95	75-90	50-75	30-45	5-15
	26-52	Clay loam--------	ML	A-7	0-5	80-100	75-95	70-85	50-70	40-50	10-20
	52-63	Gravelly clay loam, gravelly loam.	ML, SM	A-4, A-6, A-7	0	70-80	65-75	60-70	40-60	30-45	5-15
	63	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
223*:											
Konocti cobbly loam----------	0-8	Cobbly loam------	ML	A-4	15-30	75-95	70-90	60-80	50-65	25-35	NP-10
	8-16	Stony loam, stony clay loam.	ML, CL, GM, GC	A-4, A-6	20-40	65-85	60-80	50-70	45-60	30-40	5-15
	16-32	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	32-39	Very stony sandy loam, very stony loam.	SM	A-2	40-50	75-95	70-90	40-65	25-35	20-30	NP-5
	39	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Konocti stony loam----------	0-4	Stony loam-------	ML	A-4	5-20	75-95	70-90	60-80	50-65	25-35	NP-10
	4-9	Stony loam, stony clay loam.	ML, CL, GM, GC	A-4, A-6	20-40	65-85	60-80	50-70	45-60	30-40	5-15
	9-28	Very stony sandy clay loam, very stony loam, very stony clay loam.	CL, ML, SC, SM	A-6, A-7	40-50	75-95	70-90	50-80	40-65	30-50	10-20
	28	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
224*:											
Speaker----------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Marpa----------	0-15	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-70	35-50	25-35	NP-10
	15-25	Very gravelly clay loam, very gravelly sandy clay loam.	GC	A-2, A-6	5-10	30-55	25-50	20-45	10-40	30-40	10-15
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Sanhedrin-------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
225*, 226*:											
Speaker----------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Maymen----------	0-12	Gravelly loam----	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
225*, 226*:											
Marpa----------	0-15	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-70	35-50	25-35	NP-10
	15-25	Very gravelly clay loam, very gravelly sandy clay loam.	GC	A-2, A-6	5-10	30-55	25-50	20-45	10-40	30-40	10-15
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
227*:											
Speaker---------	0-15	Loam----------	ML	A-4	0	95-100	90-100	80-95	60-70	25-30	NP-5
	15-39	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	39	Weathered bedrock	---	---	---	---	---	---	---	---	---
Maymen----------	0-12	Gravelly loam----	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Millsholm-------	0-9	Loam----------	ML, CL-ML	A-4	0	80-100	75-100	70-95	50-75	25-35	5-10
	9-18	Clay loam--------	CL	A-6	0	80-100	75-100	70-95	60-85	30-40	10-20
	18	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
228*:											
Speaker---------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sanhedrin-------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
229*:											
Speaker---------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sanhedrin-------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Maymen----------	0-12	Gravelly loam----	SM, GM	A-2, A-4	0-5	60-80	50-75	30-60	25-50	20-35	NP-10
	12	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
230*:											
Speaker---------	0-8	Gravelly loam----	SM, GM	A-4	0-5	60-90	55-75	45-70	35-50	25-30	NP-5
	8-27	Gravelly clay loam, loam, clay loam.	CL, SC, GC	A-6	0-5	60-100	55-100	45-90	35-70	30-40	10-20
	27	Weathered bedrock	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
230*:											
Speaker Variant-	0-4	Loam----------	ML, CL-ML	A-4	0	80-100	75-100	60-85	50-75	25-35	5-10
	4-17	Gravelly clay loam, clay loam.	CL	A-6	0	75-90	70-85	65-80	50-65	30-40	10-20
	17	Weathered bedrock	---	---	---	---	---	---	---	---	---
Sanhedrin-------	0-8	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0	55-80	50-75	45-65	35-50	25-35	5-10
	8-57	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-10	60-80	55-75	50-70	40-55	30-40	10-20
	57	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
231*:											
Squawrock-------	0-8	Gravelly loam----	GM, SM	A-2, A-4, A-1	0-5	55-80	50-75	35-60	20-50	20-35	NP-10
	8-37	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-15
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Shortyork Variant--------	0-9	Gravelly loam----	SM, GM, SM-SC, GM-GC	A-4	0-5	55-80	50-75	45-60	35-50	25-35	5-10
	9-32	Very gravelly clay loam, very gravelly clay.	GC	A-2, A-7	0-10	30-55	25-50	20-45	15-40	40-55	15-30
	32	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
232----------	0-7	Loam----------	ML, CL-ML	A-4	0	80-100	75-100	65-85	50-75	25-35	5-10
Still	7-70	Stratified clay loam to loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-100	60-80	20-40	5-20
233----------	0-6	Loam----------	ML, CL-ML	A-4	0	80-100	75-100	65-85	50-75	25-35	5-10
Still	6-52	Stratified loam to clay loam.	CL, CL-ML	A-4, A-6	0	80-100	75-100	70-100	60-80	25-40	5-20
	52-70	Stratified very gravelly sandy loam to extremely gravelly loamy coarse sand.	GP-GM, GM	A-1	0-5	25-55	20-50	10-35	5-20	---	NP
234----------	0-3	Gravelly loam----	SM, SM-SC, GM, GM-GC	A-4	0	55-80	50-75	40-65	35-50	25-35	5-10
Still	3-36	Stratified gravelly clay loam to gravelly loam.	GC, CL, GM-GC, CL-ML	A-4, A-6	0	55-80	50-75	40-70	35-55	20-40	5-20
	36-70	Stratified clay loam to loam.	CL, CL-ML	A-4, A-6	0	75-100	75-100	65-100	50-80	20-40	5-20

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
235*:											
Still----------	0-3	Gravelly loam----	SM, SM-SC, GM, GM-GC	A-4	0	55-80	50-75	40-65	35-50	25-35	5-10
	3-36	Stratified gravelly clay loam to gravelly loam.	GC, CL, GM-GC, CL-ML	A-4, A-6	0	55-80	50-75	40-70	35-55	20-40	5-20
	36-70	Stratified clay loam to loam.	CL, CL-ML	A-4, A-6	0	75-100	75-100	65-100	50-80	20-40	5-20
Talmage---------	0-33	Very gravelly sandy loam.	GM, GP-GM	A-1, A-2	0-10	30-55	25-50	15-45	10-35	20-25	NP-5
	33-70	Stratified gravelly loam to extremely gravelly coarse sandy loam.	GM, GP-GM	A-1, A-2	0-10	30-55	25-50	15-45	10-35	20-25	NP-5
236*:											
Stonyford-------	0-5	Gravelly loam----	GM-GC, GM, SM-SC, SM	A-4	0-5	55-80	50-75	45-65	35-50	25-35	5-10
	5-10	Gravelly clay loam.	GC, CL, SC	A-6	0-5	55-80	50-75	45-70	35-60	30-40	10-15
	10	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Guenoc----------	0-11	Clay loam--------	CL	A-6	0-5	80-100	75-95	70-90	50-75	30-40	10-15
	11-36	Clay, silty clay loam, clay loam.	CL	A-6, A-7	0-5	80-100	75-95	70-90	60-85	35-50	15-25
	36	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
237---------- Talmage	0-33	Very gravelly sandy loam.	GM, GP-GM	A-1, A-2	0-10	30-55	25-50	15-45	10-35	20-25	NP-5
	33-70	Stratified gravelly loam to extremely gravelly coarse sandy loam.	GM, GP-GM	A-1, A-2	0-10	30-55	25-50	15-45	10-35	20-25	NP-5
238, 239--------- Tulelake	0-10	Silty clay loam	ML, CL	A-6, A-7	0	100	100	95-100	85-95	30-50	10-20
	10-77	Stratified silty clay loam to clay.	CL, MH, ML, CH	A-7	0	100	100	95-100	85-95	40-55	15-25
240*:											
Tyson----------	0-9	Gravelly loam----	GM, SM	A-4	0-5	55-80	50-75	40-65	35-50	25-35	NP-10
	9-15	Very gravelly loam, very gravelly clay loam.	GM-GC, GC	A-2	0-5	35-55	30-50	25-45	20-35	25-40	5-15
	15-27	Very cobbly loam, very cobbly clay loam.	GM-GC, GC, SM-SC, SC	A-4, A-6, A-2	40-50	50-75	45-70	40-65	30-50	25-40	5-15
	27	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Neuns----------	0-4	Gravelly loam----	SM, GM	A-4	0-5	55-80	50-75	40-60	35-50	15-25	NP-5
	4-31	Very gravelly sandy loam, very gravelly loam.	GM	A-1, A-2	0-10	30-55	25-50	20-45	10-35	15-25	NP-5
	31	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
241*: Vitrandepts. Cinder land.											
242, 243---------- Wappo	0-10	Loam----------	ML, CL-ML	A-4	0	85-100	80-100	60-95	50-65	25-35	5-10
	10-34	Clay----------	CH, CL	A-7	0	90-100	85-100	80-100	70-90	40-60	20-35
	34-63	Clay loam, sandy clay loam.	CL, SC	A-6, A-7	0	80-100	75-100	65-95	35-70	30-45	10-20
244---------- Wappo Variant	0-4	Clay loam--------	CL	A-6	0	85-100	75-95	70-90	55-70	30-40	10-20
	4-15	Clay----------	CH, CL	A-7	0	85-100	75-95	70-95	65-85	40-60	20-35
	15-31	Gravelly clay loam, gravelly silty clay loam, gravelly clay.	CL, CH, GC	A-7	0-5	65-80	50-75	45-70	40-65	40-60	15-35
	31-84	Very gravelly clay loam, gravelly clay loam.	GC, SC	A-2, A-6	0-5	30-70	20-60	15-55	10-45	30-40	10-20
245*: Whispering------	0-5	Loam----------	ML	A-4	0-15	80-95	75-90	65-85	50-60	25-35	NP-5
	5-15	Gravelly loam----	SM, GM	A-4, A-5	5-15	60-80	55-75	45-65	35-50	25-45	NP-10
	15-26	Very gravelly clay loam, very cobbly clay loam.	GM	A-2, A-4, A-7	10-50	40-60	35-55	30-50	25-45	30-50	5-15
	26	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Collayomi very gravelly loam--	0-15	Very gravelly loam.	GM	A-1	0-15	25-45	25-40	20-30	15-20	25-35	NP-5
	15-60	Very gravelly loam, very gravelly clay loam, extremely gravelly loam.	GM, GC	A-2	10-20	25-45	20-40	15-30	10-20	30-40	5-15
Collayomi stony loam----------	0-12	Stony loam-------	SM	A-4	15-40	75-85	70-80	60-70	40-50	25-35	NP-5
	12-36	Very cobbly clay loam, very cobbly loam, very stony loam.	GM, GC	A-2, A-4, A-6	30-50	55-65	50-60	45-55	30-45	30-40	5-15
	36-60	Very stony clay loam, very stony loam, very cobbly loam.	GM, GC	A-2, A-4, A-6	30-50	55-65	50-60	45-55	30-45	30-40	5-15
246---------- Wolfcreek	0-10	Gravelly loam----	GM, SM, SM-SC, GM-GC	A-4	0	60-80	55-75	50-65	35-50	25-35	5-10
	10-60	Stratified loam to gravelly sandy loam.	GM, SM, GM-GC, SM-SC	A-2, A-4	0	55-85	50-80	40-60	25-50	25-35	5-10

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
247---------- Wolfcreek	0-7	Loam----------	ML, CL-ML	A-4	0	90-100	75-100	70-95	55-75	25-35	5-10
	7-46	Stratified loam to clay loam.	SM-SC, SC, CL-ML, CL	A-4, A-6	0	90-100	75-95	65-90	35-60	25-40	5-15
	46-72	Stratified extremely gravelly sandy loam to very gravelly clay loam.	GC	A-2	0	30-55	25-50	20-45	10-25	30-40	10-15
248. Xerofluvents											
249*: Xerofluvents.											
Riverwash.											
250*: Yollabolly------	0-5	Very gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	20-35	NP-10
	5-14	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	20-35	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Freezeout-------	0-16	Very gravelly sandy loam.	GM	A-1	0-15	45-55	40-50	30-50	15-25	20-30	NP-5
	16-25	Extremely gravelly sandy loam, very gravelly loam, very gravelly sandy loam.	GM, GP-GM	A-1	0-30	25-55	20-50	15-35	5-20	20-30	NP-5
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
251*: Yollabolly------	0-5	Very gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	20-35	NP-10
	5-14	Very gravelly sandy loam, very gravelly loam, extremely gravelly sandy loam.	GP-GM, GM	A-1, A-2	0-5	25-55	20-50	15-45	5-30	20-35	NP-10
	14	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Rock outcrop.											
Freezeout-------	0-16	Very gravelly sandy loam.	GM	A-1	0-15	45-55	40-50	30-50	15-25	20-30	NP-5
	16-25	Extremely gravelly sandy loam, very gravelly loam, very gravelly sandy loam.	GM, GP-GM	A-1	0-30	25-55	20-50	15-35	5-20	20-30	NP-5
	25	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Frag-ments > 3 inches	Percentage passing sieve number--				Liquid limit	Plas-ticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
252*:											
Yorktree--------	0-8	Clay loam--------	CL	A-6	0	90-100	85-95	80-90	55-80	30-40	10-15
	8-24	Clay loam, clay	CL, CH	A-7	0	80-100	75-90	70-90	55-85	40-55	20-30
	24-55	Gravelly clay loam, gravelly clay.	GC, CL, CH	A-7	0	55-80	50-75	45-70	40-65	40-55	20-30
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
Hopland---------	0-6	Loam-------------	CL-ML, ML	A-4	0	85-100	80-100	65-90	50-70	25-35	5-10
	6-34	Clay loam, loam	CL	A-6	0	80-95	75-90	65-85	50-65	30-40	10-20
	34	Weathered bedrock	---	---	---	---	---	---	---	---	---
Squawrock-------	0-8	Gravelly loam----	GM, SM	A-2, A-4, A-1	0-5	55-80	50-75	35-60	20-50	20-35	NP-10
	8-37	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-15
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
253*:											
Yorkville-------	0-3	Clay loam--------	CL	A-6, A-7	0	100	95-100	90-95	70-85	30-45	10-20
	3-33	Clay loam, clay	MH, CH	A-7	0	100	100	90-100	75-95	50-60	20-30
	33-64	Gravelly clay loam, gravelly clay, clay loam.	MH, CH	A-7	0	70-90	60-80	55-75	50-70	50-60	20-30
	64	Weathered bedrock	---	---	---	---	---	---	---	---	---
Pomo------------	0-11	Loam-------------	CL-ML, ML	A-4	0-5	90-100	85-95	75-85	50-70	25-35	5-10
	11-40	Gravelly loam, gravelly clay loam.	GC, CL	A-6	0-5	55-80	50-75	45-70	35-60	30-40	10-20
	40-58	Gravelly clay, very gravelly clay loam, extremely gravelly clay loam.	GC	A-2, A-7	0-5	25-75	20-70	20-65	15-50	40-60	15-30
	58	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
254*:											
Yorkville-------	0-3	Clay loam--------	CL	A-6, A-7	0	100	95-100	90-95	70-85	30-45	10-20
	3-33	Clay loam, clay	MH, CH	A-7	0	100	100	90-100	75-95	50-60	20-30
	33-64	Gravelly clay loam, gravelly clay, clay loam.	MH, CH	A-7	0	70-90	60-80	55-75	50-70	50-60	20-30
	64	Weathered bedrock	---	---	---	---	---	---	---	---	---
Yorktree--------	0-8	Clay loam--------	CL	A-6	0	90-100	85-95	80-90	55-80	30-40	10-15
	8-24	Clay loam, clay	CL, CH	A-7	0	80-100	75-90	70-90	55-85	40-55	20-30
	24-55	Gravelly clay loam, gravelly clay.	GC, CL, CH	A-7	0	55-80	50-75	45-70	40-65	40-55	20-30
	55	Unweathered bedrock.	---	---	---	---	---	---	---	---	---

See footnote at end of table.

TABLE 15.--ENGINEERING INDEX PROPERTIES--Continued

Soil name and map symbol	Depth	USDA texture	Classification		Fragments > 3 inches	Percentage passing sieve number--				Liquid limit	Plasticity index
			Unified	AASHTO		4	10	40	200		
	In				Pct					Pct	
254*:											
Squawrock-------	0-8	Gravelly loam----	GM, SM	A-2, A-4, A-1	0-5	55-80	50-75	35-60	20-50	20-35	NP-10
	8-37	Very gravelly sandy clay loam, very gravelly clay loam, very gravelly loam.	GC	A-2	0-5	30-55	25-50	20-45	15-35	30-40	10-15
	37	Unweathered bedrock.	---	---	---	---	---	---	---	---	---
255---------- Yorkville Variant	0-8	Clay loam--------	CL	A-6	0	100	75-100	60-95	50-75	30-40	10-20
	8-31	Gravelly sandy clay.	GC, SC	A-7, A-2	0	55-80	50-75	50-70	30-45	40-50	15-25
	31-62	Clay loam, clay	CL, CH	A-7	0	90-100	85-100	75-95	75-95	40-60	15-30
	62-71	Sandy clay loam	SC	A-6	0	100	95-100	70-80	35-50	25-40	10-20

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS

[The symbol < means less than; > means more than. Entries under "Erosion factors--T" apply to the entire profile. Entries under "Organic matter" apply only to the surface layer. Absence of an entry indicates that data were not available or were not estimated]

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
101*, 102*:									
Aiken----------	0-5	20-27	0.6-2.0	0.14-0.17	5.6-6.5	Low----------	0.20	5	2-10
	5-20	27-40	0.6-2.0	0.16-0.18	5.6-6.0	Moderate-------	0.28		
	20-61	40-50	0.2-0.6	0.15-0.17	4.5-6.0	Moderate-------	0.28		
	61-74	40-50	0.2-0.6	0.12-0.15	4.5-6.0	Moderate-------	0.20		
Sobrante--------	0-10	10-25	0.6-2.0	0.13-0.17	5.6-6.5	Low----------	0.32	2	1-3
	10-38	25-35	0.6-2.0	0.13-0.18	5.6-6.5	Moderate-------	0.32		
	38	---	---	---	---	----------	----		
103, 104---------	0-13	30-40	0.2-0.6	0.17-0.20	7.4-8.4	High----------	0.28	2	1-3
Asbill	13-39	40-50	0.06-0.2	0.14-0.16	7.4-8.4	High----------	0.28		
	39	---	---	---	---	----------	----		
105*.									
Badland									
106*:									
Bally----------	0-16	20-27	0.2-0.6	0.11-0.14	6.1-7.3	Low----------	0.15	5	1-2
	16-80	35-55	0.06-0.2	0.08-0.10	6.1-7.3	Moderate-------	0.05		
Phipps----------	0-3	15-27	0.6-2.0	0.11-0.14	6.1-7.3	Low----------	0.20	5	1-2
	3-61	35-50	0.06-0.2	0.13-0.16	6.1-7.3	High----------	0.20		
107*:									
Bally----------	0-10	20-30	0.2-0.6	0.11-0.14	6.1-7.3	Moderate-------	0.15	5	1-2
	10-18	25-35	0.2-0.6	0.08-0.12	6.1-7.3	Moderate-------	0.05		
	18-37	35-55	0.06-0.2	0.08-0.10	6.1-7.3	Moderate-------	0.05		
	37-65	20-30	0.2-0.6	0.08-0.12	6.1-7.3	Moderate-------	0.05		
Phipps----------	0-6	15-27	0.6-2.0	0.13-0.16	6.1-7.3	Low----------	0.32	5	1-2
	6-21	35-50	0.06-0.2	0.13-0.16	6.1-7.3	High----------	0.20		
	21-41	20-35	0.2-0.6	0.11-0.14	6.1-7.3	Moderate-------	0.20		
	41-73	20-35	0.2-0.6	0.07-0.09	6.1-7.3	Low----------	0.15		
108*:									
Bally----------	0-10	20-30	0.2-0.6	0.11-0.14	6.1-7.3	Moderate-------	0.15	5	1-2
	10-18	25-35	0.2-0.6	0.08-0.12	6.1-7.3	Moderate-------	0.05		
	18-37	35-55	0.06-0.2	0.08-0.10	6.1-7.3	Moderate-------	0.05		
	37-65	20-30	0.2-0.6	0.08-0.12	6.1-7.3	Moderate-------	0.05		
Phipps----------	0-6	15-27	0.6-2.0	0.13-0.16	6.1-7.3	Low----------	0.32	5	1-2
	6-21	35-50	0.06-0.2	0.13-0.16	6.1-7.3	High----------	0.20		
	21-41	20-35	0.2-0.6	0.11-0.14	6.1-7.3	Moderate-------	0.20		
	41-73	20-35	0.2-0.6	0.07-0.09	6.1-7.3	Low----------	0.15		
Haploxeralfs.									
109*:									
Bamtush----------	0-7	18-25	0.6-2.0	0.09-0.13	6.1-7.3	Low----------	0.20	5	1-3
	7-31	20-27	0.6-2.0	0.09-0.10	5.6-6.5	Low----------	0.10		
	31-63	25-35	0.6-2.0	0.07-0.14	5.1-6.5	Low----------	0.10		
Neuns----------	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low----------	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low----------	0.10		
	31	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
110*, 111*:									
Bamtush	0-7	18-25	0.6-2.0	0.09-0.13	6.1-7.3	Low	0.20	5	1-3
	7-31	20-27	0.6-2.0	0.09-0.10	5.6-6.5	Low	0.10		
	31-63	25-35	0.6-2.0	0.07-0.14	5.1-6.5	Low	0.10		
Speaker	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate	0.32		
	27	---	---	---	---	---	---		
Sanhedrin	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate	0.15		
	57	---	---	---	---	---	---		
112*, 113*:									
Benridge	0-6	15-25	0.6-2.0	0.13-0.17	6.6-7.8	Low	0.28	5	1-2
	6-21	35-40	0.2-0.6	0.15-0.20	6.6-7.3	Moderate	0.20		
	21-63	35-50	0.2-0.6	0.09-0.16	6.6-7.3	Moderate	0.17		
	63-68	40-50	0.2-0.6	0.12-0.16	6.6-7.3	High	0.28		
Konocti cobbly loam	0-8	15-25	0.6-2.0	0.12-0.14	6.1-7.3	Low	0.20	2	1-2
	8-16	20-30	0.2-0.6	0.12-0.16	6.1-7.3	Low	0.24		
	16-32	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low	0.28		
	32-39	10-20	2.0-6.0	0.05-0.08	6.1-7.3	Low	0.28		
	39	---	---	---	---	---	---		
Konocti stony loam	0-4	15-25	0.6-2.0	0.14-0.17	6.1-7.3	Low	0.24	2	1-2
	4-9	20-30	0.2-0.6	0.12-0.16	6.1-7.3	Low	0.24		
	9-28	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low	0.28		
	28	---	---	---	---	---	---		
114*, 115*:									
Benridge	0-6	15-25	0.6-2.0	0.13-0.17	6.6-7.8	Low	0.28	5	1-2
	6-21	35-40	0.2-0.6	0.15-0.20	6.6-7.3	Moderate	0.20		
	21-63	35-50	0.2-0.6	0.09-0.16	6.6-7.3	Moderate	0.17		
	63-68	40-50	0.2-0.6	0.12-0.16	6.6-7.3	High	0.28		
Sodabay	0-6	10-20	0.6-2.0	0.13-0.17	6.6-7.8	Low	0.28	5	1-2
	6-26	20-30	0.6-2.0	0.13-0.16	6.6-7.8	Moderate	0.28		
	26-52	27-40	0.2-0.6	0.17-0.20	6.6-7.8	Moderate	0.24		
	52-63	20-35	0.2-0.6	0.12-0.14	6.6-7.8	Moderate	0.15		
	63	---	---	---	---	---	---		
116	0-11	15-27	0.6-2.0	0.13-0.16	6.1-7.3	Low	0.32	2	1-2
Benridge Variant	11-24	35-60	<0.06	0.04-0.06	6.1-7.3	High	0.24		
	24	---	---	---	---	---	---		
117*, 118*:									
Bottlerock	0-5	10-20	6.0-20	0.01-0.04	5.6-6.5	Low	0.10	5	<1
	5-19	15-20	2.0-6.0	0.04-0.09	5.6-6.5	Low	0.15		
	19-39	25-35	0.2-0.6	0.05-0.12	5.6-6.0	Moderate	0.20		
	39-63	40-50	0.06-0.2	0.08-0.10	5.1-6.0	High	0.15		
Glenview	0-1	10-20	2.0-6.0	0.04-0.09	5.6-7.3	Low	0.15	5	1-2
	1-6	10-25	0.6-2.0	0.11-0.13	5.1-7.3	Low	0.20		
	6-15	10-45	0.2-0.6	0.14-0.18	5.6-7.3	Moderate	0.28		
	15-65	35-50	0.2-0.6	0.10-0.17	5.6-6.5	Moderate	0.15		
Arrowhead	0-1	5-10	6.0-20	0.01-0.03	6.1-7.3	Low	0.10	2	1-2
	1-8	10-20	2.0-6.0	0.07-0.10	6.1-7.3	Low	0.20		
	8-14	25-35	0.6-2.0	0.11-0.14	6.1-7.3	Low	0.24		
	14-31	40-50	0.2-0.6	0.06-0.07	6.1-7.3	Moderate	0.15		
	31	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
119*, 120*:									
Bressa----------	0-12	15-25	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	2	.5-3
	12-26	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate-------	0.37		
	26	---	---	---	---	----------	---		
Millsholm-------	0-3	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	1	1-3
	3-11	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-------	0.37		
	11	---	---	---	---	----------	---		
121----------	0-41	40-60	0.06-0.2	0.14-0.16	7.4-8.4	High----------	0.24	5	1-4
Clear Lake	41-56	40-60	0.06-0.2	0.14-0.16	7.4-8.4	High----------	0.24		
	56-72	35-40	0.2-0.6	0.16-0.18	7.4-8.4	High----------	0.28		
122----------	0-38	40-60	0.06-0.2	0.14-0.16	6.1-7.3	High----------	0.24	5	1-2
Clear Lake	38-63	40-60	0.06-0.2	0.14-0.16	5.6-7.3	High----------	0.24		
Variant	63-72	35-40	0.2-0.6	0.16-0.18	5.6-7.3	High----------	0.28		
123----------	0-6	27-35	0.2-0.6	0.15-0.18	5.6-7.3	Moderate-------	0.32	5	1-4
Cole	6-51	35-45	0.06-0.2	0.12-0.17	6.1-8.4	High----------	0.32		
	51-62	27-45	0.06-0.2	0.12-0.17	7.4-8.4	High----------	0.32		
	62-70	27-45	0.06-0.2	0.12-0.17	7.4-8.4	High----------	0.32		
124----------	0-8	30-40	0.2-0.6	0.17-0.19	6.1-8.4	Moderate-------	0.28	5	1-2
Cole Variant	8-60	35-50	0.06-0.2	0.13-0.16	6.6-8.4	High----------	0.24		
125----------	0-20	30-40	0.2-0.6	0.17-0.19	6.1-8.4	Moderate-------	0.28	5	1-2
Cole Variant	20-60	35-50	0.06-0.2	0.13-0.16	6.6-8.4	High----------	0.24		
126*:									
Collayomi very									
gravelly loam--	0-15	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	<2
	15-60	20-30	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
Collayomi stony									
loam----------	0-12	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	<2
	12-60	20-35	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
127*, 128*:									
Collayomi-------	0-15	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	<2
	15-60	20-30	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
Aiken----------	0-5	20-27	0.6-2.0	0.14-0.17	5.6-6.5	Low----------	0.20	5	2-10
	5-20	27-40	0.6-2.0	0.16-0.18	5.6-6.0	Moderate-------	0.28		
	20-61	40-50	0.2-0.6	0.15-0.17	4.5-6.0	Moderate-------	0.28		
	61-74	40-50	0.2-0.6	0.12-0.15	4.5-6.0	Moderate-------	0.20		
Whispering------	0-5	10-20	0.6-2.0	0.13-0.15	6.1-7.3	Low----------	0.24	2	1-2
	5-15	20-27	0.6-2.0	0.11-0.13	5.6-6.5	Low----------	0.17		
	15-26	27-35	0.6-2.0	0.09-0.11	5.6-6.5	Low----------	0.10		
	26	---	---	---	---	----------	---		
129*:									
Collayomi-------	0-15	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	<2
	15-60	20-30	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
Whispering------	0-5	10-20	0.6-2.0	0.13-0.15	6.1-7.3	Low----------	0.24	2	1-2
	5-15	20-27	0.6-2.0	0.11-0.13	5.6-6.5	Low----------	0.17		
	15-26	27-35	0.6-2.0	0.09-0.11	5.6-6.5	Low----------	0.10		
	26	---	---	---	---	----------	---		
130*:									
Deadwood--------	0-4	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low----------	0.15	1	1-3
	4-13	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low----------	0.15		
	13	---	---	---	---	----------	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
130*:									
Sheetiron-------	0-3	10-25	0.6-2.0	0.09-0.14	5.1-6.0	Low----------	0.20	1	1-2
	3-29	12-25	0.6-2.0	0.05-0.10	5.1-6.0	Low----------	0.15		
	29	---	---	---	---	----------	----		
131. Fluvaquentic Haplaquolls									
132, 133---------	0-16	10-25	0.6-2.0	0.13-0.16	5.1-6.5	Moderate-------	0.37	5	<1
Forbesville	16-30	40-60	0.06-0.2	0.06-0.08	5.1-6.0	High----------	0.28		
	30-70	35-60	0.06-0.2	0.06-0.10	5.1-6.0	Moderate-------	0.20		
134*, 135*:									
Forward Variant-	0-7	10-20	2.0-6.0	0.08-0.13	5.6-6.5	Low----------	0.10	3	1-3
	7-62	10-20	2.0-6.0	0.08-0.13	5.6-6.5	Low----------	0.10		
	62	---	---	---	---	----------	----		
Kidd----------	0-4	---	2.0-6.0	0.10-0.14	5.6-6.5	Low----------	0.17	1	1-3
	4-13	---	2.0-6.0	0.08-0.14	5.1-6.0	Low----------	0.17		
	13	---	---	---	---	----------	----		
136*, 137*:									
Freezeout-------	0-16	10-15	2.0-6.0	0.07-0.09	5.6-6.5	Low----------	0.10	2	2-5
	16-25	12-18	2.0-6.0	0.04-0.06	4.5-5.5	Low----------	0.10		
	25	---	---	---	---	----------	----		
Yollabolly------	0-5	10-25	0.6-2.0	0.05-0.10	4.5-6.0	Low----------	0.10	1	<2
	5-14	10-25	0.6-2.0	0.05-0.10	4.5-5.5	Low----------	0.10		
	14	---	---	---	---	----------	----		
138*, 139*:									
Glenview--------	0-1	10-20	2.0-6.0	0.04-0.09	5.6-7.3	Low----------	0.15	5	1-2
	1-6	10-25	0.6-2.0	0.11-0.13	5.1-7.3	Low----------	0.20		
	6-15	10-45	0.2-0.6	0.14-0.18	5.6-7.3	Moderate-------	0.28		
	15-65	35-50	0.2-0.6	0.10-0.17	5.6-6.5	Moderate-------	0.15		
Arrowhead-------	0-1	5-10	6.0-20	0.01-0.03	6.1-7.3	Low----------	0.10	2	1-2
	1-8	10-20	2.0-6.0	0.07-0.10	6.1-7.3	Low----------	0.20		
	8-14	25-35	0.6-2.0	0.11-0.14	6.1-7.3	Low----------	0.24		
	14-31	40-50	0.2-0.6	0.06-0.07	6.1-7.3	Moderate-------	0.15		
	31	---	---	---	---	----------	----		
140*:									
Glenview--------	0-1	10-20	2.0-6.0	0.04-0.09	5.6-7.3	Low----------	0.15	5	1-2
	1-6	10-25	0.6-2.0	0.11-0.13	5.1-7.3	Low----------	0.20		
	6-15	10-45	0.2-0.6	0.14-0.18	5.6-7.3	Moderate-------	0.28		
	15-65	35-50	0.2-0.6	0.10-0.17	5.6-6.5	Moderate-------	0.15		
Bottlerock------	0-5	10-20	6.0-20	0.01-0.04	5.6-6.5	Low----------	0.10	5	<1
	5-19	15-20	2.0-6.0	0.04-0.09	5.6-6.5	Low----------	0.15		
	19-39	25-35	0.2-0.6	0.05-0.12	5.6-6.0	Moderate-------	0.20		
	39-63	40-50	0.06-0.2	0.08-0.10	5.1-6.0	High----------	0.15		
141*:									
Henneke---------	0-3	20-40	0.6-2.0	0.08-0.12	5.6-7.8	Moderate-------	0.20	1	2-7
	3-11	30-40	0.2-0.6	0.09-0.12	5.6-7.8	Moderate-------	0.20		
	11-19	35-55	0.2-0.6	0.06-0.09	6.6-8.4	Moderate-------	0.15		
	19	---	---	---	---	----------	----		
Montara---------	0-12	18-35	0.2-0.6	0.14-0.19	6.6-8.4	Moderate-------	0.32	1	1-3
	12	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
142*:									
Henneke	0-3	20-40	0.6-2.0	0.08-0.12	5.6-7.8	Moderate	0.20	1	2-7
	3-11	30-40	0.2-0.6	0.09-0.12	5.6-7.8	Moderate	0.20		
	11-19	35-55	0.2-0.6	0.06-0.09	6.6-8.4	Moderate	0.15		
	19	---	---	---	---	---	---		
Montara	0-12	18-35	0.2-0.6	0.14-0.19	6.6-8.4	Moderate	0.32	1	1-3
	12	---	---	---	---	---	---		
Rock outcrop.									
143*:									
Henneke	0-3	20-40	0.6-2.0	0.08-0.12	5.6-7.8	Moderate	0.20	1	2-7
	3-11	30-40	0.2-0.6	0.09-0.12	5.6-7.8	Moderate	0.20		
	11-19	35-55	0.2-0.6	0.06-0.09	6.6-8.4	Moderate	0.15		
	19	---	---	---	---	---	---		
Okiota	0-1	27-35	0.2-0.6	0.08-0.12	6.6-7.8	Moderate	0.10	1	2-4
	1-3	27-35	0.2-0.6	0.16-0.18	6.6-7.8	Moderate	0.28		
	3-14	40-55	0.06-0.2	0.14-0.16	6.6-7.8	High	0.20		
	14	---	---	---	---	---	---		
144, 145	0-16	18-25	0.6-2.0	0.13-0.16	5.6-7.3	Low	0.32	5	1-2
Jafa	16-68	25-35	0.2-0.6	0.10-0.18	5.1-6.5	Moderate	0.20		
146*:									
Jafa loam	0-13	18-25	0.6-2.0	0.13-0.16	5.6-7.3	Low	0.32	5	1-2
	13-25	20-27	0.6-2.0	0.10-0.14	5.1-6.5	Low	0.24		
	25-85	25-35	0.2-0.6	0.10-0.18	5.1-6.5	Moderate	0.20		
Jafa gravelly loam	0-17	18-25	0.6-2.0	0.10-0.14	5.6-7.3	Low	0.20	5	1-2
	17-24	20-27	0.2-0.6	0.10-0.14	5.1-6.5	Low	0.24		
	24-39	25-35	0.2-0.6	0.10-0.18	5.1-6.5	Moderate	0.20		
	39-89	25-35	0.2-0.6	0.08-0.11	5.1-6.5	Low	0.15		
147	0-11	7-18	2.0-6.0	0.12-0.14	6.1-7.8	Low	0.32	5	1-3
Kelsey	11-60	7-18	2.0-6.0	0.11-0.14	6.1-7.8	Low	0.32		
148*, 149*:									
Kidd	0-9	---	2.0-6.0	0.10-0.14	5.6-6.5	Low	0.17	1	1-3
	9-16	---	2.0-6.0	0.08-0.14	5.1-6.0	Low	0.17		
	16	---	---	---	---	---	---		
Forward	0-9	10-18	2.0-6.0	0.13-0.17	5.1-6.5	Low	0.24	2	2-4
	9-25	10-18	2.0-6.0	0.07-0.14	4.5-6.0	Low	0.20		
	25	---	---	---	---	---	---		
150	0-10	15-27	0.6-2.0	0.14-0.17	6.1-7.3	Low	0.32	5	1-2
Kilaga Variant	10-42	35-40	0.2-0.6	0.16-0.20	6.1-7.3	Moderate	0.32		
	42-71	40-50	0.06-0.2	0.14-0.17	5.6-6.5	High	0.28		
151*:									
Konocti stony loam	0-4	15-25	0.6-2.0	0.14-0.17	6.1-7.3	Low	0.24	2	1-2
	4-9	20-30	0.2-0.6	0.12-0.16	6.1-7.3	Low	0.24		
	9-28	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low	0.28		
	28	---	---	---	---	---	---		
Konocti cobbly loam	0-8	15-25	0.6-2.0	0.12-0.14	6.1-7.3	Low	0.20	2	1-2
	8-16	20-30	0.2-0.6	0.12-0.16	6.1-7.3	Low	0.24		
	16-32	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low	0.28		
	32-39	10-20	2.0-6.0	0.05-0.08	6.1-7.3	Low	0.28		
	39	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
151*:									
Benridge--------	0-6	15-25	0.6-2.0	0.13-0.17	6.6-7.8	Low----------	0.28	5	1-2
	6-21	35-40	0.2-0.6	0.15-0.20	6.6-7.3	Moderate-------	0.20		
	21-63	35-50	0.2-0.6	0.09-0.16	6.6-7.3	Moderate-------	0.17		
	63-68	40-50	0.2-0.6	0.12-0.16	6.6-7.3	High----------	0.28		
152*, 153*:									
Konocti---------	0-10	15-25	0.6-2.0	0.12-0.15	6.1-7.3	Low----------	0.24	2	1-2
	10-29	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.28		
	29	---	---	---	---	----------	----		
Hambright-------	0-4	20-27	0.6-2.0	0.06-0.10	6.1-7.3	Low----------	0.15	1	2-8
	4-16	20-27	0.6-2.0	0.06-0.11	6.1-7.3	Low----------	0.15		
	16	---	---	---	---	----------	----		
154*:									
Konocti---------	0-10	15-25	0.6-2.0	0.12-0.15	6.1-7.3	Low----------	0.24	2	1-2
	10-29	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.28		
	29	---	---	---	---	----------	----		
Hambright-------	0-4	20-27	0.6-2.0	0.06-0.10	6.1-7.3	Low----------	0.15	1	2-8
	4-16	20-27	0.6-2.0	0.06-0.11	6.1-7.3	Low----------	0.15		
	16	---	---	---	---	----------	----		
Rock outcrop.									
155*, 156*:									
Konocti Variant-	0-4	18-25	0.6-2.0	0.11-0.13	6.1-7.3	Low----------	0.20	3	1-2
	4-11	20-27	0.6-2.0	0.07-0.10	6.1-7.3	Low----------	0.15		
	11-22	27-35	0.2-0.6	0.08-0.12	6.1-7.3	Moderate-------	0.10		
	22-53	27-35	0.2-0.6	0.09-0.12	6.1-7.3	Moderate-------	0.10		
	53	---	---	---	---	----------	----		
Konocti---------	0-11	15-25	0.6-2.0	0.12-0.14	6.1-7.3	Low----------	0.20	2	1-2
	11-28	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.28		
	28	---	---	---	---	----------	----		
Hambright-------	0-4	20-27	0.6-2.0	0.06-0.10	6.1-7.3	Low----------	0.15	1	2-8
	4-16	20-27	0.6-2.0	0.06-0.11	6.1-7.3	Low----------	0.15		
	16	---	---	---	---	----------	----		
157---------------	0-7	35-40	0.2-0.6	0.17-0.20	7.4-8.4	Moderate-------	0.32	5	2-4
Landlow Variant	7-23	40-60	0.06-0.2	0.14-0.16	7.4-8.4	High----------	0.28		
	23-84	35-60	0.2-0.6	0.14-0.17	7.4-8.4	High----------	0.28		
158---------------	0-31	10-27	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	5	1-2
Lupoyoma	31-84	18-35	0.2-0.6	0.15-0.19	6.1-7.8	Moderate-------	0.49		
159, 160, 161----	0-19	15-27	0.6-2.0	0.12-0.16	5.6-7.3	Moderate-------	0.32	5	<1
Manzanita	19-43	20-35	0.2-0.6	0.15-0.18	5.6-7.3	Moderate-------	0.20		
	43-84	35-50	0.06-0.2	0.10-0.18	5.6-7.3	High----------	0.24		
162, 163---------	0-7	15-27	0.6-2.0	0.10-0.13	5.6-7.3	Low----------	0.28	5	<1
Manzanita	7-35	20-35	0.2-0.6	0.11-0.15	5.6-7.3	Moderate-------	0.20		
	35-60	35-50	0.06-0.2	0.08-0.15	5.6-7.3	Moderate-------	0.20		
164, 165---------	0-6	35-40	<0.06	0.15-0.17	6.6-8.4	High----------	0.28	5	1-3
Maxwell	6-84	40-55	<0.06	0.12-0.16	7.9-8.4	High----------	0.28		
166*, 167*:									
Maymen----------	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low----------	0.20	1	<1
	12	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
166*, 167*:									
Etsel	0-3	12-18	0.6-2.0	0.06-0.13	5.1-6.5	Low	0.20	1	1-2
	3-10	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10		
	10	---	---	---	---	---	---		
Mayacama	0-5	10-20	2.0-6.0	0.05-0.08	5.6-7.3	Low	0.15	2	1-2
	5-31	15-25	0.6-2.0	0.05-0.08	5.6-6.5	Moderate	0.15		
	31	---	---	---	---	---	---		
168*:									
Maymen	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low	0.20	1	<1
	12	---	---	---	---	---	---		
Etsel	0-3	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10	1	1-2
	3-8	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10		
	8	---	---	---	---	---	---		
Snook	0-5	10-25	0.6-2.0	0.13-0.15	5.1-6.5	Low	0.32	1	<2
	5	---	---	---	---	---	---		
169*:									
Maymen	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low	0.20	1	<1
	12	---	---	---	---	---	---		
Etsel	0-3	12-18	0.6-2.0	0.06-0.13	5.1-6.5	Low	0.20	1	1-2
	3-8	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10		
	8	---	---	---	---	---	---		
Snook	0-5	10-25	0.6-2.0	0.13-0.15	5.1-6.5	Low	0.32	1	<2
	5	---	---	---	---	---	---		
170*:									
Maymen	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low	0.20	1	<1
	12	---	---	---	---	---	---		
Etsel	0-3	12-18	0.6-2.0	0.06-0.13	5.1-6.5	Low	0.20	1	1-2
	3-10	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10		
	10	---	---	---	---	---	---		
Speaker	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate	0.32		
	27	---	---	---	---	---	---		
171*:									
Maymen	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low	0.20	1	<1
	12	---	---	---	---	---	---		
Hopland	0-6	15-25	0.6-2.0	0.14-0.16	5.6-7.3	Low	0.32	2	1-2
	6-34	20-35	0.2-0.6	0.15-0.18	5.6-6.5	Moderate	0.28		
	34	---	---	---	---	---	---		
Etsel	0-3	12-18	0.6-2.0	0.06-0.13	5.1-6.5	Low	0.20	1	1-2
	3-10	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10		
	10	---	---	---	---	---	---		
172*, 173*, 174*:									
Maymen	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low	0.20	1	<1
	12	---	---	---	---	---	---		
Hopland	0-6	15-25	0.6-2.0	0.14-0.16	5.6-7.3	Low	0.32	2	1-2
	6-34	20-35	0.2-0.6	0.15-0.18	5.6-6.5	Moderate	0.28		
	34	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
172*, 173*, 174*:									
Mayacama	0-5	10-20	2.0-6.0	0.05-0.08	5.6-7.3	Low	0.15	2	1-2
	5-31	15-25	0.6-2.0	0.05-0.08	5.6-6.5	Moderate	0.15		
	31	---	---	---	---	---	---		
175*:									
Maymen	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low	0.20	1	<1
	12	---	---	---	---	---	---		
Millsholm	0-3	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	1	1-3
	3-11	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.37		
	11	---	---	---	---	---	---		
Bressa	0-12	15-25	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	2	.5-3
	12-26	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate	0.37		
	26	---	---	---	---	---	---		
176	0-10	5-15	2.0-6.0	0.09-0.12	6.1-7.3	Low	0.37	5	<1
Maywood Variant	10-64	5-15	0.6-2.0	0.09-0.15	6.1-7.3	Low	0.37		
177*:									
Millsholm	0-3	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	1	1-3
	3-11	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.37		
	11	---	---	---	---	---	---		
Bressa	0-12	15-25	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	2	.5-3
	12-26	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate	0.37		
	26	---	---	---	---	---	---		
178*:									
Millsholm	0-3	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	1	1-3
	3-11	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.37		
	11	---	---	---	---	---	---		
Bressa	0-12	15-25	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	2	.5-3
	12-26	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate	0.37		
	26	---	---	---	---	---	---		
Hopland	0-6	15-25	0.6-2.0	0.14-0.16	5.6-7.3	Low	0.32	2	1-2
	6-34	20-35	0.2-0.6	0.15-0.18	5.6-6.5	Moderate	0.28		
	34	---	---	---	---	---	---		
179*:									
Millsholm	0-3	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	1	1-3
	3-11	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.37		
	11	---	---	---	---	---	---		
Squawrock	0-8	12-25	0.6-2.0	0.09-0.12	5.1-7.3	Low	0.20	2	1-2
	8-37	20-35	0.6-2.0	0.07-0.11	5.1-6.5	Moderate	0.10		
	37	---	---	---	---	---	---		
Pomo	0-11	15-25	0.6-2.0	0.13-0.16	6.6-7.3	Low	0.37	3	<2
	11-40	25-35	0.6-2.0	0.08-0.14	5.6-7.3	Moderate	0.20		
	40-58	30-50	0.2-0.6	0.08-0.14	5.6-7.3	High	0.15		
	58	---	---	---	---	---	---		
180	0-6	10-25	0.6-2.0	0.15-0.17	6.1-7.3	Low	0.32	5	1-2
Mocho Variant	6-40	25-35	0.2-0.6	0.16-0.19	6.1-7.3	Moderate	0.28		
	40-70	20-30	0.2-0.6	0.11-0.15	6.1-7.3	Moderate	0.24		
181*, 182*:									
Neice	0-11	15-27	0.6-2.0	0.09-0.12	6.1-7.3	Low	0.20	5	1-2
	11-20	27-35	0.2-0.6	0.11-0.14	6.1-7.3	Low	0.24		
	20-70	35-55	0.2-0.6	0.08-0.09	6.1-7.3	Moderate	0.15		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
181*, 182*:									
Sobrante	0-10	10-25	0.6-2.0	0.13-0.17	5.6-6.5	Low	0.32	2	1-3
	10-38	25-35	0.6-2.0	0.13-0.18	5.6-6.5	Moderate	0.32		
	38	---	---	---	---	---	---		
Hambright	0-4	20-27	0.6-2.0	0.06-0.10	6.1-7.3	Low	0.15	1	2-8
	4-16	20-27	0.6-2.0	0.06-0.11	6.1-7.3	Low	0.15		
	16	---	---	---	---	---	---		
183*:									
Neuns	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low	0.10		
	31	---	---	---	---	---	---		
Bamtush	0-7	18-25	0.6-2.0	0.09-0.13	6.1-7.3	Low	0.20	5	1-3
	7-31	20-27	0.6-2.0	0.09-0.10	5.6-6.5	Low	0.10		
	31-63	25-35	0.6-2.0	0.07-0.14	5.1-6.5	Low	0.10		
Deadwood	0-4	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15	1	1-3
	4-13	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15		
	13	---	---	---	---	---	---		
184*:									
Neuns	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low	0.10		
	31	---	---	---	---	---	---		
Deadwood	0-4	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15	1	1-3
	4-13	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15		
	13	---	---	---	---	---	---		
Bamtush	0-7	18-25	0.6-2.0	0.09-0.13	6.1-7.3	Low	0.20	5	1-3
	7-31	20-27	0.6-2.0	0.09-0.10	5.6-6.5	Low	0.10		
	31-63	25-35	0.6-2.0	0.07-0.14	5.1-6.5	Low	0.10		
185*:									
Neuns	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low	0.10		
	31	---	---	---	---	---	---		
Decy	0-8	10-25	2.0-6.0	0.09-0.11	4.5-5.0	Low	0.20	2	1-2
	8-15	10-25	2.0-6.0	0.08-0.11	4.5-6.0	Low	0.20		
	15-24	15-25	2.0-6.0	0.07-0.10	4.5-6.0	Low	0.10		
	24	---	---	---	---	---	---		
Sanhedrin	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate	0.15		
	57	---	---	---	---	---	---		
186*, 187*:									
Neuns	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low	0.10		
	31	---	---	---	---	---	---		
Sanhedrin	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate	0.15		
	57	---	---	---	---	---	---		
Deadwood	0-4	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15	1	1-3
	4-13	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15		
	13	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
188*:									
Neuns----------	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low----------	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low----------	0.10		
	31	---	---	---	---	----------	---		
Sanhedrin-------	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low----------	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate-------	0.15		
	57	---	---	---	---	----------	---		
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	---		
189*, 190*:									
Neuns----------	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low----------	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low----------	0.10		
	31	---	---	---	---	----------	---		
Sheetiron-------	0-3	10-25	0.6-2.0	0.09-0.14	5.1-6.0	Low----------	0.20	1	1-2
	3-29	12-25	0.6-2.0	0.05-0.10	5.1-6.0	Low----------	0.15		
	29	---	---	---	---	----------	---		
Deadwood--------	0-4	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low----------	0.15	1	1-3
	4-13	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low----------	0.15		
	13	---	---	---	---	----------	---		
191*:									
Neuns----------	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low----------	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low----------	0.10		
	31	---	---	---	---	----------	---		
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	---		
192*:									
Okiota----------	0-1	27-35	0.2-0.6	0.08-0.12	6.6-7.8	Moderate-------	0.10	1	2-4
	1-3	27-35	0.2-0.6	0.16-0.18	6.6-7.8	Moderate-------	0.28		
	3-14	40-55	0.06-0.2	0.14-0.16	6.6-7.8	High----------	0.20		
	14	---	---	---	---	----------	---		
Henneke---------	0-3	20-40	0.6-2.0	0.08-0.12	5.6-7.8	Moderate-------	0.20	1	2-7
	3-11	30-40	0.2-0.6	0.09-0.12	5.6-7.8	Moderate-------	0.20		
	11-19	35-55	0.2-0.6	0.06-0.09	6.6-8.4	Moderate-------	0.15		
	19	---	---	---	---	----------	---		
193*:									
Okiota----------	0-1	27-35	0.2-0.6	0.08-0.12	6.6-7.8	Moderate-------	0.10	1	2-4
	1-3	27-35	0.2-0.6	0.16-0.18	6.6-7.8	Moderate-------	0.28		
	3-14	40-55	0.06-0.2	0.14-0.16	6.6-7.8	High----------	0.20		
	14	---	---	---	---	----------	---		
Henneke---------	0-3	20-40	0.6-2.0	0.08-0.12	5.6-7.8	Moderate-------	0.20	1	2-7
	3-11	30-40	0.2-0.6	0.09-0.12	5.6-7.8	Moderate-------	0.20		
	11-19	35-55	0.2-0.6	0.06-0.09	6.6-8.4	Moderate-------	0.15		
	19	---	---	---	---	----------	---		
Dubakella-------	0-7	20-27	0.2-0.6	0.08-0.11	5.6-7.3	Low----------	0.20	2	4-10
	7-30	35-50	0.06-0.2	0.08-0.10	6.1-7.8	Moderate-------	0.24		
	30	---	---	---	---	----------	---		
194----------	0-8	10-27	0.6-2.0	0.15-0.17	5.1-7.3	Low----------	0.49	5	1-3
Oxalis Variant	8-17	27-50	0.06-0.2	0.15-0.19	5.6-7.3	High----------	0.37		
	17-70	40-55	0.06-0.2	0.13-0.16	6.1-7.3	High----------	0.32		
	70-84	15-30	0.2-0.6	0.15-0.17	7.4-9.0	Low----------	0.49		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
195*, 196*, 197*:									
Phipps clay loam	0-7	27-35	0.2-0.6	0.16-0.19	6.1-6.5	Moderate	0.32	5	1-2
	7-42	35-50	0.06-0.2	0.13-0.16	6.1-6.5	High	0.32		
	42-60	27-35	0.2-0.6	0.16-0.19	6.1-6.5	Moderate	0.32		
Phipps loam	0-6	15-27	0.6-2.0	0.13-0.16	6.1-7.3	Low	0.32	5	1-2
	6-21	35-50	0.06-0.2	0.13-0.16	6.1-7.3	High	0.20		
	21-41	20-35	0.2-0.6	0.11-0.14	6.1-7.3	Moderate	0.20		
	41-73	20-35	0.2-0.6	0.07-0.09	6.1-7.3	Low	0.15		
198*:									
Pomo	0-11	15-25	0.6-2.0	0.13-0.16	6.6-7.3	Low	0.37	3	<2
	11-40	25-35	0.6-2.0	0.08-0.14	5.6-7.3	Moderate	0.20		
	40-58	30-50	0.2-0.6	0.08-0.14	5.6-7.3	High	0.15		
	58	---	---	---	---	---	---		
Bressa	0-12	15-25	0.6-2.0	0.14-0.17	5.6-7.3	Low	0.43	2	.5-3
	12-26	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate	0.37		
	26	---	---	---	---	---	---		
199*. Riverwash									
200*: Rock outcrop.									
Etsel	0-3	12-18	0.6-2.0	0.06-0.13	5.1-6.5	Low	0.20	1	1-2
	3-8	12-18	0.6-2.0	0.04-0.10	5.1-6.5	Low	0.10		
	8	---	---	---	---	---	---		
Snook	0-5	10-25	0.6-2.0	0.13-0.15	5.1-6.5	Low	0.32	1	<2
	5	---	---	---	---	---	---		
201*, 202*:									
Sanhedrin	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate	0.15		
	57	---	---	---	---	---	---		
Kekawaka	0-9	20-27	0.6-2.0	0.14-0.17	5.6-6.5	Low	0.32	5	1-2
	9-28	35-40	0.2-0.6	0.15-0.19	5.1-6.5	Moderate	0.28		
	28-42	40-55	0.2-0.6	0.14-0.16	5.1-6.5	Moderate	0.24		
	42-68	40-55	0.2-0.6	0.11-0.14	5.1-6.5	Moderate	0.20		
	68	---	---	---	---	---	---		
Speaker	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate	0.32		
	27	---	---	---	---	---	---		
203 San Joaquin Variant	0-21	10-20	2.0-6.0	0.13-0.15	5.1-6.5	Low	0.37	2	<1
	21-25	35-50	<0.06	0.04-0.06	4.5-6.5	High	0.32		
	25-30	---	---	---	---	---	---		
	30-65	10-25	0.6-2.0	0.10-0.15	6.1-8.4	Low	0.28		
204*, 205*:									
Sheetiron	0-3	10-25	0.6-2.0	0.09-0.14	5.1-6.0	Low	0.20	1	1-2
	3-29	12-25	0.6-2.0	0.05-0.10	5.1-6.0	Low	0.15		
	29	---	---	---	---	---	---		
Deadwood	0-4	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15	1	1-3
	4-13	10-20	2.0-6.0	0.02-0.05	5.6-6.5	Low	0.15		
	13	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
206*:									
Shortyork Variant--------	0-9	18-27	0.6-2.0	0.10-0.13	6.1-7.3	Low----------	0.20	2	1-2
	9-32	35-50	<0.06	0.06-0.10	5.6-6.5	Moderate-------	0.10		
	32	---	---	---	---	----------	----		
Yorkville-------	0-3	27-32	0.2-0.6	0.17-0.18	5.6-7.8	Moderate-------	0.32	3	1-2
	3-33	35-50	<0.06	0.15-0.28	6.6-8.4	High----------	0.24		
	33-64	35-45	<0.06	0.14-0.17	6.6-8.4	High----------	0.20		
	64	---	---	---	---	----------	----		
Squawrock-------	0-8	12-25	0.6-2.0	0.09-0.12	5.1-7.3	Low----------	0.20	2	1-2
	8-37	20-35	0.6-2.0	0.07-0.11	5.1-6.5	Moderate-------	0.10		
	37	---	---	---	---	----------	----		
207*, 208*:									
Skyhigh---------	0-2	20-27	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.37	2	2-4
	2-8	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate-------	0.32		
	8-38	35-50	0.06-0.2	0.14-0.17	5.6-7.3	High----------	0.28		
	38	---	---	---	---	----------	----		
Asbill----------	0-13	30-40	0.2-0.6	0.17-0.20	7.4-8.4	High----------	0.28	2	1-3
	13-39	40-50	0.06-0.2	0.14-0.16	7.4-8.4	High----------	0.28		
	39	---	---	---	---	----------	----		
209*:									
Skyhigh---------	0-2	20-27	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.37	2	2-4
	2-8	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate-------	0.32		
	8-38	35-50	0.06-0.2	0.14-0.17	5.6-7.3	High----------	0.28		
	38	---	---	---	---	----------	----		
Millsholm-------	0-6	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	1	1-3
	6-16	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-------	0.37		
	16	---	---	---	---	----------	----		
210*:									
Skyhigh---------	0-2	20-27	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.37	2	2-4
	2-8	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate-------	0.32		
	8-38	35-50	0.06-0.2	0.14-0.17	5.6-7.3	High----------	0.28		
	38	---	---	---	---	----------	----		
Sleeper---------	0-12	20-27	0.6-2.0	0.15-0.17	6.1-7.3	Low----------	0.37	3	<2
	12-45	35-55	0.06-0.2	0.14-0.16	5.6-6.5	High----------	0.32		
	45	---	---	---	---	----------	----		
Millsholm-------	0-6	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	1	1-3
	6-16	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-------	0.37		
	16	---	---	---	---	----------	----		
211*, 212*:									
Skyhigh---------	0-2	20-27	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.37	2	2-4
	2-8	27-35	0.2-0.6	0.16-0.19	5.6-7.3	Moderate-------	0.32		
	8-38	35-50	0.06-0.2	0.14-0.17	5.6-7.3	High----------	0.28		
	38	---	---	---	---	----------	----		
Sleeper---------	0-4	20-27	0.6-2.0	0.15-0.17	6.1-7.3	Low----------	0.37	3	<2
	4-48	35-55	0.06-0.2	0.14-0.16	5.6-6.5	High----------	0.32		
	48	---	---	---	---	----------	----		
Millsholm-------	0-9	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	1	1-3
	9-18	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-------	0.37		
	18	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
213*, 214*, 215*:									
Sleeper Variant-	0-12	20-27	0.6-2.0	0.14-0.16	6.1-7.3	Low	0.32	4	1-2
	12-37	27-35	0.2-0.6	0.17-0.18	6.6-8.4	Moderate	0.28		
	37-56	35-45	0.06-0.2	0.12-0.15	6.6-8.4	High	0.24		
	56-75	30-40	0.2-0.6	0.17-0.18	6.6-8.4	High	0.28		
	75	---	---	---	---	---	---		
Sleeper	0-12	20-27	0.6-2.0	0.15-0.17	6.1-7.3	Low	0.37	3	<2
	12-45	35-55	0.06-0.2	0.14-0.16	5.6-6.5	High	0.32		
	45	---	---	---	---	---	---		
216*, 217*:									
Sobrante	0-10	10-25	0.6-2.0	0.13-0.17	5.6-6.5	Low	0.32	2	1-3
	10-38	25-35	0.6-2.0	0.13-0.18	5.6-6.5	Moderate	0.32		
	38	---	---	---	---	---	---		
Collayomi	0-15	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low	0.10	5	<2
	15-60	20-30	0.6-2.0	0.04-0.07	6.1-7.3	Low	0.10		
Whispering	0-5	10-20	0.6-2.0	0.13-0.15	6.1-7.3	Low	0.24	2	1-2
	5-15	20-27	0.6-2.0	0.11-0.13	5.6-6.5	Low	0.17		
	15-26	27-35	0.6-2.0	0.09-0.11	5.6-6.5	Low	0.10		
	26	---	---	---	---	---	---		
218*, 219*:									
Sobrante	0-10	10-25	0.6-2.0	0.13-0.17	5.6-6.5	Low	0.32	2	1-3
	10-38	25-35	0.6-2.0	0.13-0.18	5.6-6.5	Moderate	0.32		
	38	---	---	---	---	---	---		
Guenoc	0-11	27-35	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.32	2	<2
	11-36	35-45	0.2-0.6	0.14-0.17	5.6-7.3	Moderate	0.28		
	36	---	---	---	---	---	---		
Hambright	0-4	20-27	0.6-2.0	0.06-0.10	6.1-7.3	Low	0.15	1	2-8
	4-16	20-27	0.6-2.0	0.06-0.11	6.1-7.3	Low	0.15		
	16	---	---	---	---	---	---		
220*:									
Sobrante	0-10	10-25	0.6-2.0	0.13-0.17	5.6-6.5	Low	0.32	2	1-3
	10-38	25-35	0.6-2.0	0.13-0.18	5.6-6.5	Moderate	0.32		
	38	---	---	---	---	---	---		
Hambright	0-4	20-27	0.6-2.0	0.06-0.10	6.1-7.3	Low	0.15	1	2-8
	4-16	20-27	0.6-2.0	0.06-0.11	6.1-7.3	Low	0.15		
	16	---	---	---	---	---	---		
Guenoc	0-11	27-35	0.6-2.0	0.17-0.19	5.6-7.3	Moderate	0.32	2	<2
	11-36	35-45	0.2-0.6	0.14-0.17	5.6-7.3	Moderate	0.28		
	36	---	---	---	---	---	---		
221, 222	0-6	10-20	0.6-2.0	0.13-0.17	6.6-7.8	Low	0.28	5	1-2
Sodabay	6-26	20-30	0.6-2.0	0.13-0.16	6.6-7.8	Moderate	0.28		
	26-52	27-40	0.2-0.6	0.17-0.20	6.6-7.8	Moderate	0.24		
	52-63	20-35	0.2-0.6	0.12-0.14	6.6-7.8	Moderate	0.15		
	63	---	---	---	---	---	---		
223*:									
Sodabay	0-6	10-20	0.6-2.0	0.13-0.17	6.6-7.8	Low	0.28	5	1-2
	6-26	20-30	0.6-2.0	0.13-0.16	6.6-7.8	Moderate	0.28		
	26-52	27-40	0.2-0.6	0.17-0.20	6.6-7.8	Moderate	0.24		
	52-63	20-35	0.2-0.6	0.12-0.14	6.6-7.8	Moderate	0.15		
	63	---	---	---	---	---	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
223*:									
Konocti cobbly loam----------	0-8	15-25	0.6-2.0	0.12-0.14	6.1-7.3	Low----------	0.20	2	1-2
	8-16	20-30	0.2-0.6	0.12-0.16	6.1-7.3	Low----------	0.24		
	16-32	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.28		
	32-39	10-20	2.0-6.0	0.05-0.08	6.1-7.3	Low----------	0.28		
	39	---	---	---	---	----------	---		
Konocti stony loam----------	0-4	15-25	0.6-2.0	0.14-0.17	6.1-7.3	Low----------	0.24	2	1-2
	4-9	20-30	0.2-0.6	0.12-0.16	6.1-7.3	Low----------	0.24		
	9-28	25-35	0.2-0.6	0.06-0.11	6.1-7.3	Low----------	0.28		
	28	---	---	---	---	----------	---		
224*:									
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	---		
Marpa----------	0-15	15-25	0.6-2.0	0.10-0.12	5.6-6.5	Low----------	0.20	2	<2
	15-25	27-35	0.6-2.0	0.06-0.10	5.1-6.0	Low----------	0.15		
	25	---	---	---	---	----------	---		
Sanhedrin-------	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low----------	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate-------	0.15		
	57	---	---	---	---	----------	---		
225*, 226*:									
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	---		
Maymen----------	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low----------	0.20	1	<1
	12	---	---	---	---	----------	---		
Marpa----------	0-15	15-25	0.6-2.0	0.10-0.12	5.6-6.5	Low----------	0.20	2	<2
	15-25	27-35	0.6-2.0	0.06-0.10	5.1-6.0	Low----------	0.15		
	25	---	---	---	---	----------	---		
227*:									
Speaker---------	0-15	18-25	0.6-2.0	0.14-0.16	5.1-6.5	Low----------	0.24	2	2-5
	15-39	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	39	---	---	---	---	----------	---		
Maymen----------	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low----------	0.20	1	<1
	12	---	---	---	---	----------	---		
Millsholm-------	0-9	20-27	0.6-2.0	0.14-0.17	5.6-7.3	Low----------	0.43	1	1-3
	9-18	27-30	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-------	0.37		
	18	---	---	---	---	----------	---		
228*:									
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	---		
Sanhedrin-------	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low----------	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate-------	0.15		
	57	---	---	---	---	----------	---		
229*:									
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	---		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
229*:									
Sanhedrin-------	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low----------	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate-------	0.15		
	57	---	---	---	---	----------	----		
Maymen----------	0-12	10-27	0.6-2.0	0.08-0.14	4.5-6.5	Low----------	0.20	1	<1
	12	---	---	---	---	----------	----		
230*:									
Speaker---------	0-8	18-25	0.6-2.0	0.11-0.16	5.1-6.5	Low----------	0.20	2	2-5
	8-27	25-35	0.2-0.6	0.12-0.20	4.5-6.0	Moderate-------	0.32		
	27	---	---	---	---	----------	----		
Speaker Variant-	0-4	15-27	0.6-2.0	0.13-0.17	5.6-7.3	Low----------	0.37	1	1-2
	4-17	27-35	0.2-0.6	0.15-0.17	5.6-6.5	Moderate-------	0.32		
	17	---	---	---	---	----------	----		
Sanhedrin-------	0-8	18-25	0.6-2.0	0.11-0.14	5.6-6.5	Low----------	0.20	3	1-2
	8-57	25-35	0.2-0.6	0.10-0.13	5.1-6.5	Moderate-------	0.15		
	57	---	---	---	---	----------	----		
231*:									
Squawrock-------	0-8	12-25	0.6-2.0	0.09-0.12	5.1-7.3	Low----------	0.20	2	1-2
	8-37	20-35	0.6-2.0	0.07-0.11	5.1-6.5	Moderate-------	0.10		
	37	---	---	---	---	----------	----		
Shortyork Variant--------	0-9	18-27	0.6-2.0	0.10-0.13	6.1-7.3	Low----------	0.20	2	1-2
	9-32	35-50	<0.06	0.06-0.10	5.6-6.5	Moderate-------	0.10		
	32	---	---	---	---	----------	----		
232----------	0-7	20-27	0.6-2.0	0.14-0.16	6.1-7.3	Low----------	0.28	5	1-4
Still	7-70	20-35	0.2-0.6	0.14-0.18	6.6-8.4	Moderate-------	0.28		
233----------	0-6	20-27	0.6-2.0	0.14-0.16	6.1-7.3	Low----------	0.28	5	1-4
Still	6-52	20-35	0.2-0.6	0.14-0.18	6.1-7.3	Moderate-------	0.28		
	52-70	5-15	6.0-20	0.02-0.07	6.1-8.4	Low----------	0.10		
234----------	0-3	20-27	0.6-2.0	0.10-0.13	6.1-7.3	Low----------	0.20	5	1-4
Still	3-36	20-35	0.2-0.6	0.10-0.13	6.6-8.4	Moderate-------	0.20		
	36-70	20-35	0.2-0.6	0.14-0.18	6.6-8.4	Moderate-------	0.28		
235*:									
Still----------	0-3	20-27	0.6-2.0	0.10-0.13	6.1-7.3	Low----------	0.20	5	1-4
	3-36	20-35	0.2-0.6	0.10-0.13	6.6-8.4	Moderate-------	0.20		
	36-70	20-35	0.2-0.6	0.14-0.18	6.6-8.4	Moderate-------	0.28		
Talmage---------	0-33	5-18	2.0-6.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	1-2
	33-70	5-18	2.0-6.0	0.04-0.07	6.1-7.8	Low----------	0.10		
236*:									
Stonyford-------	0-5	20-27	0.6-2.0	0.12-0.14	5.6-7.3	Low----------	0.24	1	.5-2
	5-10	27-35	0.2-0.6	0.13-0.16	5.6-7.3	Moderate-------	0.24		
	10	---	---	---	---	----------	----		
Guenoc----------	0-11	27-35	0.6-2.0	0.17-0.19	5.6-7.3	Moderate-------	0.32	2	<2
	11-36	35-45	0.2-0.6	0.14-0.17	5.6-7.3	Moderate-------	0.28		
	36	---	---	---	---	----------	----		
237----------	0-33	5-18	2.0-6.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	1-2
Talmage	33-70	5-18	2.0-6.0	0.04-0.07	6.1-7.8	Low----------	0.10		
238, 239---------	0-10	27-40	0.06-0.2	0.18-0.20	5.6-6.5	Moderate-------	0.43	5	1-3
Tulelake	10-77	35-50	0.06-0.2	0.14-0.17	6.1-8.4	High----------	0.37		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
240*:									
Tyson----------	0-9	18-27	0.6-2.0	0.10-0.15	5.6-7.3	Low----------	0.20	2	2-10
	9-15	20-30	0.6-2.0	0.07-0.12	4.5-6.0	Low----------	0.10		
	15-27	20-30	0.6-2.0	0.07-0.12	4.5-6.0	Low----------	0.10		
	27	---	---	---	---	----------	----		
Neuns----------	0-4	6-17	0.6-2.0	0.09-0.13	5.1-6.5	Low----------	0.15	2	<1
	4-31	8-18	0.6-2.0	0.05-0.08	5.1-6.5	Low----------	0.10		
	31	---	---	---	---	----------	----		
241*:									
Vitrandepts.									
Cinder land.									
242, 243---------	0-10	15-25	0.6-2.0	0.13-0.15	5.6-6.5	Low----------	0.37	5	1-3
Wappo	10-34	40-55	<0.06	0.06-0.08	6.1-7.3	High----------	0.28		
	34-63	25-40	0.06-2.0	0.12-0.15	6.6-8.4	Moderate-------	0.28		
244----------	0-4	27-35	0.2-0.6	0.15-0.18	6.1-6.5	Moderate-------	0.32	5	1-2
Wappo Variant	4-15	40-60	<0.06	0.06-0.08	5.6-6.0	High----------	0.24		
	15-31	35-60	<0.06	0.06-0.08	6.1-6.5	High----------	0.20		
	31-84	30-40	0.2-0.6	0.07-0.09	6.6-7.3	Moderate-------	0.20		
245*:									
Whispering------	0-5	10-20	0.6-2.0	0.13-0.15	6.1-7.3	Low----------	0.24	2	1-2
	5-15	20-27	0.6-2.0	0.11-0.13	5.6-6.5	Low----------	0.17		
	15-26	27-35	0.6-2.0	0.09-0.11	5.6-6.5	Low----------	0.10		
	26	---	---	---	---	----------	----		
Collayomi very gravelly loam--	0-15	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	<2
	15-60	20-30	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
Collayomi stony loam----------	0-12	10-20	0.6-2.0	0.04-0.07	5.6-7.3	Low----------	0.10	5	<2
	12-36	20-35	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
	36-60	20-30	0.6-2.0	0.04-0.07	6.1-7.3	Low----------	0.10		
246----------	0-10	15-27	0.6-2.0	0.10-0.13	6.6-7.3	Low----------	0.20	5	<1
Wolfcreek	10-60	20-25	0.2-0.6	0.10-0.15	6.6-7.3	Low----------	0.24		
247----------	0-7	15-27	0.6-2.0	0.14-0.16	6.6-7.3	Low----------	0.37	5	<1
Wolfcreek	7-46	18-35	0.2-0.6	0.15-0.19	6.6-7.3	Moderate-------	0.32		
	46-72	20-35	0.2-0.6	0.05-0.10	6.6-7.3	Low----------	0.10		
248.									
Xerofluvents									
249*:									
Xerofluvents.									
Riverwash.									
250*:									
Yollabolly------	0-5	10-25	0.6-2.0	0.05-0.10	4.5-6.0	Low----------	0.10	1	<2
	5-14	10-25	0.6-2.0	0.05-0.10	4.5-5.5	Low----------	0.10		
	14	---	---	---	---	----------	----		
Freezeout-------	0-16	10-15	2.0-6.0	0.07-0.09	5.6-6.5	Low----------	0.10	2	2-5
	16-25	12-18	2.0-6.0	0.04-0.06	4.5-5.5	Low----------	0.10		
	25	---	---	---	---	----------	----		

See footnote at end of table.

TABLE 16.--PHYSICAL AND CHEMICAL PROPERTIES OF THE SOILS--Continued

Soil name and map symbol	Depth	Clay	Permeability	Available water capacity	Soil reaction	Shrink-swell potential	Erosion factors		Organic matter
							K	T	
	In	Pct	In/hr	In/in	pH				Pct
251*:									
Yollabolly------	0-5	10-25	0.6-2.0	0.05-0.10	4.5-6.0	Low----------	0.10	1	<2
	5-14	10-25	0.6-2.0	0.05-0.10	4.5-5.5	Low----------	0.10		
	14	---	---	---	---	----------	----		
Rock outcrop.									
Freezeout-------	0-16	10-15	2.0-6.0	0.07-0.09	5.6-6.5	Low----------	0.10	2	2-5
	16-25	12-18	2.0-6.0	0.04-0.06	4.5-5.5	Low----------	0.10		
	25	---	---	---	---	----------	----		
252*:									
Yorktree--------	0-8	27-35	0.6-2.0	0.16-0.18	5.6-7.3	Moderate-------	0.28	3	1-2
	8-24	35-50	<0.06	0.12-0.15	5.6-7.3	High----------	0.20		
	24-55	35-50	<0.06	0.10-0.13	5.6-7.3	High----------	0.20		
	55	---	---	---	---	----------	----		
Hopland---------	0-6	15-25	0.6-2.0	0.14-0.16	5.6-7.3	Low----------	0.32	2	1-2
	6-34	20-35	0.2-0.6	0.15-0.18	5.6-6.5	Moderate-------	0.28		
	34	---	---	---	---	----------	----		
Squawrock-------	0-8	12-25	0.6-2.0	0.09-0.12	5.1-7.3	Low----------	0.20	2	1-2
	8-37	20-35	0.6-2.0	0.07-0.11	5.1-6.5	Moderate-------	0.10		
	37	---	---	---	---	----------	----		
253*:									
Yorkville-------	0-3	27-32	0.2-0.6	0.17-0.18	5.6-7.8	Moderate-------	0.32	3	1-2
	3-33	35-50	<0.06	0.15-0.28	6.6-8.4	High----------	0.24		
	33-64	35-45	<0.06	0.14-0.17	6.6-8.4	High----------	0.20		
	64	---	---	---	---	----------	----		
Pomo------------	0-11	15-25	0.6-2.0	0.13-0.16	6.6-7.3	Low----------	0.37	3	<2
	11-40	25-35	0.6-2.0	0.08-0.14	5.6-7.3	Moderate-------	0.20		
	40-58	30-50	0.2-0.6	0.08-0.14	5.6-7.3	High----------	0.15		
	58	---	---	---	---	----------	----		
254*:									
Yorkville-------	0-3	27-32	0.2-0.6	0.17-0.18	5.6-7.8	Moderate-------	0.32	3	1-2
	3-33	35-50	<0.06	0.15-0.28	6.6-8.4	High----------	0.24		
	33-64	35-45	<0.06	0.14-0.17	6.6-8.4	High----------	0.20		
	64	---	---	---	---	----------	----		
Yorktree--------	0-8	27-35	0.6-2.0	0.16-0.18	5.6-7.3	Moderate-------	0.28	3	1-2
	8-24	35-50	<0.06	0.12-0.15	5.6-7.3	High----------	0.20		
	24-55	35-50	<0.06	0.10-0.13	5.6-7.3	High----------	0.20		
	55	---	---	---	---	----------	----		
Squawrock-------	0-8	12-25	0.6-2.0	0.09-0.12	5.1-7.3	Low----------	0.20	2	1-2
	8-37	20-35	0.6-2.0	0.07-0.11	5.1-6.5	Moderate-------	0.10		
	37	---	---	---	---	----------	----		
255-------------	0-8	27-35	0.2-0.6	0.15-0.18	6.6-7.8	Moderate-------	0.28	5	1-3
Yorkville Variant	8-31	35-50	0.06-0.2	0.09-0.14	7.4-8.4	Moderate-------	0.17		
	31-62	35-50	0.06-0.2	0.12-0.16	7.4-8.4	High----------	0.20		
	62-71	20-35	0.2-0.6	0.16-0.18	7.4-8.4	Moderate-------	0.32		

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 17.--SOIL AND WATER FEATURES

["Flooding" and "water table" and terms such as "rare," "brief," "apparent," and "perched" are explained in the text. The symbol < means less than; > means more than. Absence of an entry indicates that the feature is not a concern or that data were not estimated]

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
101*, 102*:											
Aiken	B	None	---	---	>6.0	---	---	>60	---	High	High.
Sobrante	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
103, 104 Asbill	D	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
105*. Badland											
106*, 107*:											
Bally	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Phipps	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
108*:											
Bally	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Phipps	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Haploxeralfs.											
109*:											
Bamtush	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Neuns	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
110*, 111*:											
Bamtush	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Sanhedrin	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
112*, 113*:											
Benridge	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Konocti cobbly loam	B	None	---	---	>6.0	---	---	20-04	Hard	Moderate	Low.
Konocti stony loam	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
114*, 115*:											
Benridge	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Sodabay	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
116 Benridge Variant	D	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Low.
117*, 118*:											
Bottlerock	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Glenview	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Arrowhead	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
119*, 120*: Bressa	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Millsholm	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
121--- Clear Lake	D	Rare	---	---	3.0-5.0	Apparent	Dec-Mar	>60	---	High	High.
122--- Clear Lake Variant	D	Rare	---	---	3.0-5.0	Apparent	Dec-Mar	>60	---	High	High.
123--- Cole	C	Rare	---	---	>6.0	---	---	>60	---	High	Moderate.
124, 125--- Cole Variant	C	Rare	---	---	>6.0	---	---	>60	---	High	Low.
126*: Collayomi very gravelly loam---	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Collayomi stony loam---	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
127*, 128*: Collayomi	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Aiken	B	None	---	---	>6.0	---	---	>60	---	High	High.
Whispering	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
129*: Collayomi	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Whispering	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
130*: Deadwood	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Sheetiron	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
131. Fluvaquentic Haplaquolls											
132, 133--- Forbesville	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
134*, 135*: Forward Variant--	B	None	---	---	>6.0	---	---	60-72	Hard	Moderate	Moderate.
Kidd	D	None	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate.
136*, 137*: Freezeout	B	None	---	---	>6.0	---	---	20-40	Hard	High	High.
Yollabolly	D	None	---	---	>6.0	---	---	10-20	Hard	High	High.
138*, 139*: Glenview	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Arrowhead	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
140*:											
Glenview	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Bottlerock	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
141*:											
Henneke	D	None	---	---	>6.0	---	---	10-20	Hard	High	Moderate.
Montara	D	None	---	---	>6.0	---	---	10-20	Hard	High	Low.
142*:											
Henneke	D	None	---	---	>6.0	---	---	10-20	Hard	High	Moderate.
Montara	D	None	---	---	>6.0	---	---	10-20	Hard	High	Low.
Rock outcrop.											
143*:											
Henneke	D	None	---	---	>6.0	---	---	10-20	Hard	High	Moderate.
Okiota	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
144, 145 Jafa	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
146*:											
Jafa loam	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Jafa gravelly loam	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
147 Kelsey	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low.
148*, 149*:											
Kidd	D	None	---	---	>6.0	---	---	12-20	Hard	Moderate	Moderate.
Forward	B	None	---	---	>6.0	---	---	20-40	Soft	High	High.
150 Kilaga Variant	C	None	---	---	3.0-6.0	Perched	Dec-Mar	>60	---	Moderate	Moderate.
151*:											
Konocti stony loam	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Konocti cobbly loam	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Benridge	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
152*, 153*:											
Konocti	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Hambright	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
154*:											
Konocti	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Hambright	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Rock outcrop.											

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
155*, 156*: Konocti Variant--	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Low.
Konocti	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Hambright	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
157--- Landlow Variant	D	Occasional	Brief	Dec-Mar	0.5-1.0	Apparent	Dec-Mar	>60	---	High	Low.
158--- Lupoyoma	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
159, 160, 161--- Manzanita	C	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
162, 163--- Manzanita	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
164, 165--- Maxwell	D	None	---	---	3.5-6.0	Apparent	Dec-Mar	>60	---	High	Low.
166*, 167*: Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Etsel	D	None	---	---	>6.0	---	---	6-12	Hard	Moderate	Moderate.
Mayacama	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
168*, 169*: Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Etsel	D	None	---	---	>6.0	---	---	6-12	Hard	Moderate	Moderate.
Snook	D	None	---	---	>6.0	---	---	4-10	Hard	Moderate	Moderate.
170*: Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Etsel	D	None	---	---	>6.0	---	---	6-12	Hard	Moderate	Moderate.
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
171*: Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Hopland	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
Etsel	D	None	---	---	>6.0	---	---	6-12	Hard	Moderate	Moderate.
172*, 173*, 174*: Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Hopland	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
Mayacama	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
175*: Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Millsholm	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Bressa	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
176---------- Maywood Variant	B	Occasional	Brief-----	Nov-Mar	>6.0	---	---	>60	---	Moderate	Low.
177*:											
Millsholm--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Bressa----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
178*:											
Millsholm--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Bressa----------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Hopland----------	B	None--------	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
179*:											
Millsholm--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Squawrock--------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Pomo-------------	B	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
180---------- Mocho Variant	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
181*, 182*:											
Neice------------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Low.
Sobrante---------	B	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Hambright--------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
183*:											
Neuns------------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Bamtush----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Deadwood---------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
184*:											
Neuns------------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Deadwood---------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Bamtush----------	B	None--------	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
185*:											
Neuns------------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Decy-------------	B	None--------	---	---	>6.0	---	---	20-40	Hard	High-----	High.
Sanhedrin--------	B	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
186*, 187*:											
Neuns------------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Sanhedrin--------	B	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Deadwood---------	D	None--------	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
188*:											
Neuns------------	C	None--------	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Sanhedrin--------	B	None--------	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
188*: Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
189*, 190*: Neuns	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Sheetiron	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Deadwood	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
191*: Neuns	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
192*: Okiota	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Henneke	D	None	---	---	>6.0	---	---	10-20	Hard	High	Moderate.
193*: Okiota	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Henneke	D	None	---	---	>6.0	---	---	10-20	Hard	High	Moderate.
Dubakella	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
194--- Oxalis Variant	C	None	---	---	>6.0	---	---	>60	---	High	Moderate.
195*, 196*, 197*: Phipps clay loam-	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Phipps loam	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
198*: Pomo	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Bressa	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
199*. Riverwash											
200*: Rock outcrop.											
Etsel	D	None	---	---	>6.0	---	---	6-12	Hard	Moderate	Moderate.
Snook	D	None	---	---	>6.0	---	---	4-10	Hard	Moderate	Moderate.
201*, 202*: Sanhedrin	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Kekawaka	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
203--- San Joaquin Variant	D	None	---	---	>6.0	---	---	>60	---	High	High.
204*, 205*: Sheetiron	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Deadwood	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
206*:											
Shortyork Variant	D	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Yorkville	D	None	---	---	>6.0	---	---	40-60	Soft	High	Low.
Squawrock	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
207*, 208*:											
Skyhigh	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Asbill	D	None	---	---	>6.0	---	---	20-40	Soft	High	Low.
209*:											
Skyhigh	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Millsholm	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
210*, 211*, 212*:											
Skyhigh	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Sleeper	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Millsholm	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
213*, 214*, 215*:											
Sleeper Variant	C	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Sleeper	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
216*, 217*:											
Sobrante	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Collayomi	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Whispering	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
218*, 219*:											
Sobrante	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Guenoc	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Hambright	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
220*:											
Sobrante	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Hambright	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Low.
Guenoc	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
221, 222 Sodabay	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
223*:											
Sodabay	B	None	---	---	>6.0	---	---	>60	---	Moderate	Low.
Konocti cobbly loam	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
Konocti stony loam	B	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Low.
224*:											
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
224*:											
Marpa	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Sanhedrin	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
225*, 226*:											
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Marpa	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
227*:											
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
Millsholm	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
228*:											
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Sanhedrin	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
229*:											
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Sanhedrin	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Maymen	D	None	---	---	>6.0	---	---	12-20	Hard	High	High.
230*:											
Speaker	C	None	---	---	>6.0	---	---	20-40	Soft	High	High.
Speaker Variant	C	None	---	---	>6.0	---	---	10-20	Soft	Moderate	Moderate.
Sanhedrin	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
231*:											
Squawrock	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Shortyork Variant	D	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
232, 233, 234--- Still	B	Rare	---	---	>6.0	---	---	>60	---	High	Low.
235*:											
Still	B	Rare	---	---	>6.0	---	---	>60	---	High	Low.
Talmage	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
236*:											
Stonyford	D	None	---	---	>6.0	---	---	10-20	Hard	Moderate	Moderate.
Guenoc	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
237--- Talmage	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
238--- Tulelake	D	Frequent	Long to very long.	Dec-Apr	+3-1.5	Apparent	Dec-Mar	>60	---	High	Moderate.
239--- Tulelake	D	Rare	---	---	1.5-3.0	Apparent	Dec-Mar	>60	---	High	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
240*:											
Tyson	B	None	---	---	>6.0	---	---	20-40	Hard	High	High.
Neuns	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
241*:											
Vitrandepts.											
Cinder land.											
242, 243 Wappo	D	None	---	---	>6.0	---	---	>60	---	High	Moderate.
244 Wappo Variant	D	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
245*:											
Whispering	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
Collayomi very gravelly loam	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
Collayomi stony loam	B	None	---	---	>6.0	---	---	>60	---	Moderate	Moderate.
246, 247 Wolfcreek	B	Rare	---	---	>6.0	---	---	>60	---	Moderate	Low.
248. Xerofluvents											
249*:											
Xerofluvents.											
Riverwash.											
250*:											
Yollabolly	D	None	---	---	>6.0	---	---	10-20	Hard	High	High.
Freezeout	B	None	---	---	>6.0	---	---	20-40	Hard	High	High.
251*:											
Yollabolly	D	None	---	---	>6.0	---	---	10-20	Hard	High	High.
Rock outcrop.											
Freezeout	B	None	---	---	>6.0	---	---	20-40	Hard	High	High.
252*:											
Yorktree	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
Hopland	B	None	---	---	>6.0	---	---	20-40	Soft	Moderate	Moderate.
Squawrock	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
253*:											
Yorkville	D	None	---	---	>6.0	---	---	40-60	Soft	High	Low.
Pomo	B	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.
254*:											
Yorkville	D	None	---	---	>6.0	---	---	40-60	Soft	High	Low.
Yorktree	C	None	---	---	>6.0	---	---	40-60	Hard	Moderate	Moderate.

See footnote at end of table.

TABLE 17.--SOIL AND WATER FEATURES--Continued

Soil name and map symbol	Hydrologic group	Flooding			High water table			Bedrock		Risk of corrosion	
		Frequency	Duration	Months	Depth	Kind	Months	Depth	Hardness	Uncoated steel	Concrete
					Ft			In			
254*: Squawrock	C	None	---	---	>6.0	---	---	20-40	Hard	Moderate	Moderate.
255--- Yorkville Variant	C	None	---	---	>6.0	---	---	>60	---	High	Low.

* See description of the map unit for composition and behavior characteristics of the map unit.

TABLE 18.--CLASSIFICATION OF THE SOILS

[An asterisk in the first column indicates that the soil is a taxadjunct to the series. See text for a description of those characteristics of the soil that are outside the range of the series]

Soil name	Family or higher taxonomic class
Aiken	Clayey, oxidic, mesic Xeric Haplohumults
Arrowhead	Clayey-skeletal, mixed, mesic Ultic Haploxeralfs
Asbill	Fine, montmorillonitic, thermic Typic Chromoxererts
Bally	Clayey-skeletal, mixed, thermic Typic Haploxeralfs
Bamtush	Loamy-skeletal, mixed, mesic Ultic Palexeralfs
Benridge	Fine, mixed, thermic Mollic Palexeralfs
Benridge Variant	Fine, mixed, thermic Mollic Palexeralfs
Bottlerock	Loamy-skeletal, mixed, mesic Ultic Palexeralfs
*Bressa	Fine-loamy, mixed, thermic Typic Haploxeralfs
Clear Lake	Fine, montmorillonitic, thermic Typic Pelloxererts
Clear Lake Variant	Fine, montmorillonitic, thermic Typic Pelloxererts
Cole	Fine, mixed, thermic Pachic Argixerolls
Cole Variant	Fine, mixed, thermic Cumulic Haploxerolls
Collayomi	Loamy-skeletal, mixed, mesic Ultic Haploxeralfs
Deadwood	Loamy-skeletal, mixed, mesic Dystric Lithic Xerochrepts
Decy	Loamy-skeletal, mixed, mesic Typic Xerumbrepts
Dubakella	Clayey-skeletal, serpentinitic, mesic Mollic Haploxeralfs
Etsel	Loamy-skeletal, mixed, nonacid, mesic Lithic Xerorthents
Fluvaquentic Haplaquolls	Fluvaquentic Haplaquolls
Forbesville	Fine, mixed, thermic Ultic Palexeralfs
Forward	Medial, mesic Typic Vitrandepts
Forward Variant	Medial-skeletal, mesic Typic Vitrandepts
Freezeout	Loamy-skeletal, mixed, frigid Typic Xerumbrepts
Glenview	Fine, halloysitic, mesic Ultic Palexeralfs
Guenoc	Fine, kaolinitic, thermic Typic Rhodoxeralfs
Hambright	Loamy-skeletal, mixed, thermic Lithic Haploxerolls
Haploxeralfs	Haploxeralfs
Henneke	Clayey-skeletal, serpentinitic, thermic Lithic Argixerolls
Hopland	Fine-loamy, mixed, mesic Typic Haploxeralfs
Jafa	Fine-loamy, mixed, mesic Ultic Palexeralfs
Kekawaka	Fine, kaolinitic, mesic Ultic Palexeralfs
Kelsey	Coarse-loamy, mixed, thermic Fluventic Haploxerolls
Kidd	Medial, mesic Lithic Vitrandepts
Kilaga Variant	Fine, mixed, thermic Mollic Haploxeralfs
Konocti	Loamy-skeletal, mixed, thermic Ultic Haploxeralfs
Konocti Variant	Loamy-skeletal, mixed, thermic Ultic Haploxeralfs
Landlow Variant	Fine, montmorillonitic, thermic Aquic Haploxerolls
Lupoyoma	Fine-silty, mixed, thermic Cumulic Ultic Haploxerolls
Manzanita	Fine-loamy, mixed, thermic Ultic Palexeralfs
Marpa	Loamy-skeletal, mixed, mesic Ultic Haploxeralfs
Maxwell	Fine, montmorillonitic, thermic Typic Pelloxererts
Mayacama	Loamy-skeletal, mixed, mesic Dystric Xerochrepts
Maymen	Loamy, mixed, mesic Dystric Lithic Xerochrepts
Maywood Variant	Coarse-loamy, mixed, nonacid, thermic Typic Xerofluvents
Millsholm	Loamy, mixed, thermic Lithic Xerochrepts
Mocho Variant	Fine-loamy, mixed, thermic Fluventic Haploxerolls
Montara	Loamy, serpentinitic, thermic Lithic Haploxerolls
Neice	Clayey-skeletal, montmorillonitic, thermic Mollic Palexeralfs
Neuns	Loamy-skeletal, mixed, mesic Dystric Xerochrepts
Okiota	Clayey, serpentinitic, thermic Lithic Argixerolls
Oxalis Variant	Fine, montmorillonitic, thermic Vertic Xerochrepts
Phipps	Fine, mixed, thermic Mollic Haploxeralfs
Pomo	Fine-loamy, mixed, thermic Typic Haploxeralfs
San Joaquin Variant	Fine, mixed, thermic Abruptic Durixeralfs
Sanhedrin	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Sheetiron	Loamy-skeletal, mixed, mesic Dystric Xerochrepts
Shortyork Variant	Clayey-skeletal, mixed, thermic Ultic Argixerolls
Skyhigh	Fine, montmorillonitic, thermic Mollic Haploxeralfs
Sleeper	Fine, montmorillonitic, thermic Mollic Haploxeralfs
Sleeper Variant	Fine, montmorillonitic, thermic Mollic Haploxeralfs
Snook	Loamy, mixed, nonacid, thermic Lithic Xerorthents
Sobrante	Fine-loamy, mixed, thermic Mollic Haploxeralfs
Sodabay	Fine-loamy, mixed, thermic Mollic Haploxeralfs

TABLE 18.--CLASSIFICATION OF THE SOILS--Continued

Soil name	Family or higher taxonomic class
[1]*Speaker	Fine-loamy, mixed, mesic Ultic Haploxeralfs
Speaker Variant	Loamy, mixed, mesic, shallow Ultic Haploxeralfs
[2]Squawrock	Loamy-skeletal, mixed, thermic Mollic Haploxeralfs
[2]*Still	Fine-loamy, mixed, thermic Cumulic Haploxerolls
Stonyford	Loamy, mixed, thermic Lithic Mollic Haploxeralfs
Talmage	Loamy-skeletal, mixed, thermic Fluventic Haploxerolls
Tulelake	Fine, montmorillonitic, nonacid, thermic Aeric Fluvaquents
Tyson	Loamy-skeletal, mixed, mesic Typic Xerumbrepts
Vitrandepts	Vitrandepts
Wappo	Fine, montmorillonitic, thermic Mollic Palexeralfs
Wappo Variant	Fine, montmorillonitic, thermic Mollic Palexeralfs
Whispering	Loamy-skeletal, mixed, mesic Ultic Haploxeralfs
Wolfcreek	Fine-loamy, mixed, nonacid, thermic Typic Xerofluvents
Xerofluvents	Xerofluvents
Yollabolly	Loamy-skeletal, mixed, nonacid, frigid Lithic Xerorthents
Yorktree	Fine, mixed, mesic Ultic Argixerolls
Yorkville	Fine, mixed, thermic Typic Argixerolls
Yorkville Variant	Fine, mixed, thermic Typic Argixerolls

[1] The Speaker soils in map units 170, 224, 225, 226, 227, 228, and 229 are a taxadjunct to the series.
[2] The Still soils in map unit 235 are a taxadjunct to the series.

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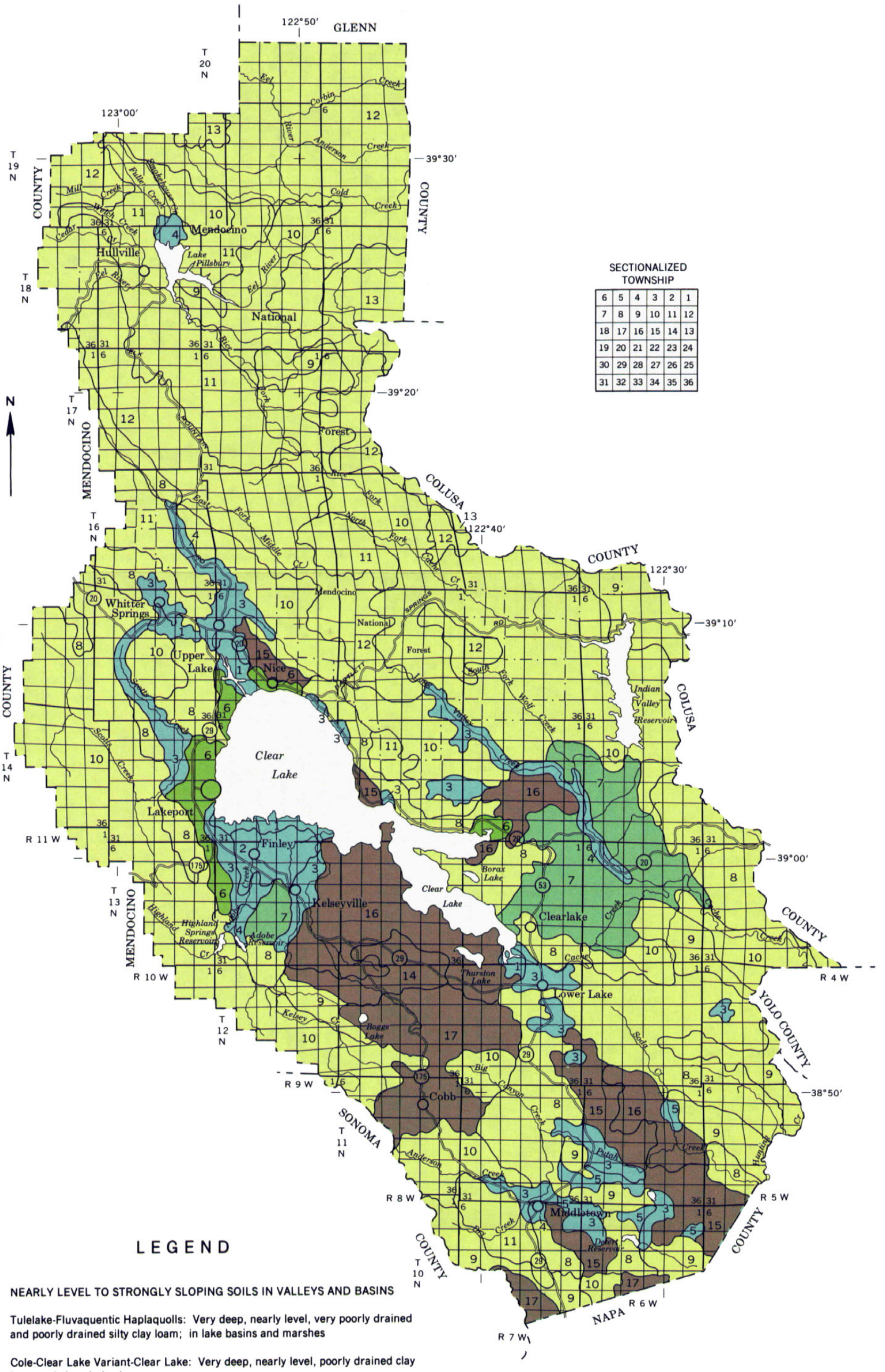
Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

LEGEND

NEARLY LEVEL TO STRONGLY SLOPING SOILS IN VALLEYS AND BASINS

1 — Tulelake-Fluvaquentic Haplaquolls: Very deep, nearly level, very poorly drained and poorly drained silty clay loam; in lake basins and marshes

2 — Cole-Clear Lake Variant-Clear Lake: Very deep, nearly level, poorly drained clay loam and clay; in basins

3 — Still-Lupoyoma: Very deep, nearly level, moderately well drained and well drained loam and silt loam; on alluvial plains and flood plains

4 — Talmage-Xerofluvents-Riverwash: Very deep, nearly level to moderately sloping, somewhat excessively drained very gravelly sandy loam and very gravelly loamy sand, and Riverwash; on alluvial fans and flood plains

5 — Maxwell-Yorkville Variant: Very deep, nearly level to strongly sloping, somewhat poorly drained and well drained clay loam; on valley and basin floors and rims

GENTLY SLOPING TO MODERATELY STEEP SOILS ON DISSECTED ALLUVIAL TERRACES

6 — Manzanita-Wappo-Forbesville: Very deep, gently sloping to moderately steep, moderately well drained and well drained loam; on dissected alluvial terraces

MODERATELY SLOPING TO VERY STEEP SOILS ON UPLIFTED, DISSECTED HILLS

7 — Phipps-Bally: Very deep, gently sloping to very steep, well drained loam and gravelly sandy clay loam; on uplifted, dissected hills

MODERATELY SLOPING TO VERY STEEP SOILS ON HILLS AND MOUNTAINS

8 — Millsholm-Skyhigh-Bressa: Shallow and moderately deep, moderately sloping to steep, well drained loam; on hills

9 — Henneke-Okiota-Montara: Shallow, moderately sloping to steep, well drained and somewhat excessively drained very gravelly loam and clay loam; on hills and mountains

10 — Maymen-Etsel: Shallow, moderately sloping to very steep, somewhat excessively drained loam and gravelly loam; on hills and mountains

11 — Sanhedrin-Speaker-Kekawaka: Moderately deep to very deep, moderately sloping to very steep, well drained loam and gravelly loam; on mountains

12 — Neuns-Deadwood-Sheetiron: Shallow and moderately deep, moderately steep to very steep, well drained and somewhat excessively drained gravelly loam and very gravelly sandy loam; on mountains

13 — Freezeout-Yollabolly: Shallow and moderately deep, steep and very steep, well drained and excessively drained very gravelly sandy loam; on mountaintops

GENTLY SLOPING TO VERY STEEP SOILS ON VOLCANIC HILLS AND MOUNTAINS

14 — Glenview-Bottlerock-Arrowhead: Moderately deep and very deep, gently sloping to steep, well drained very gravelly loam, extremely gravelly loam, and extremely gravelly sandy loam; on obsidian hills

15 — Sobrante-Guenoc-Hambright: Shallow and moderately deep, gently sloping to very steep, well drained loam, clay loam, and very gravelly loam; on basalt hills

16 — Konocti-Benridge: Moderately deep and very deep, gently sloping to very steep, well drained cobbly loam and loam; on andesite, basalt, and dacite hills and mountains

17 — Collayomi-Aiken-Whispering: Moderately deep and very deep, moderately sloping to very steep, well drained very gravelly loam and loam; on andesite, basalt, and dacite mountains

Compiled 1985

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
FOREST SERVICE
UNITED STATES DEPARTMENT OF INTERIOR
BUREAU OF LAND MANAGEMENT
UNIVERSITY OF CALIFORNIA AGRICULTURAL EXPERIMENT STATION

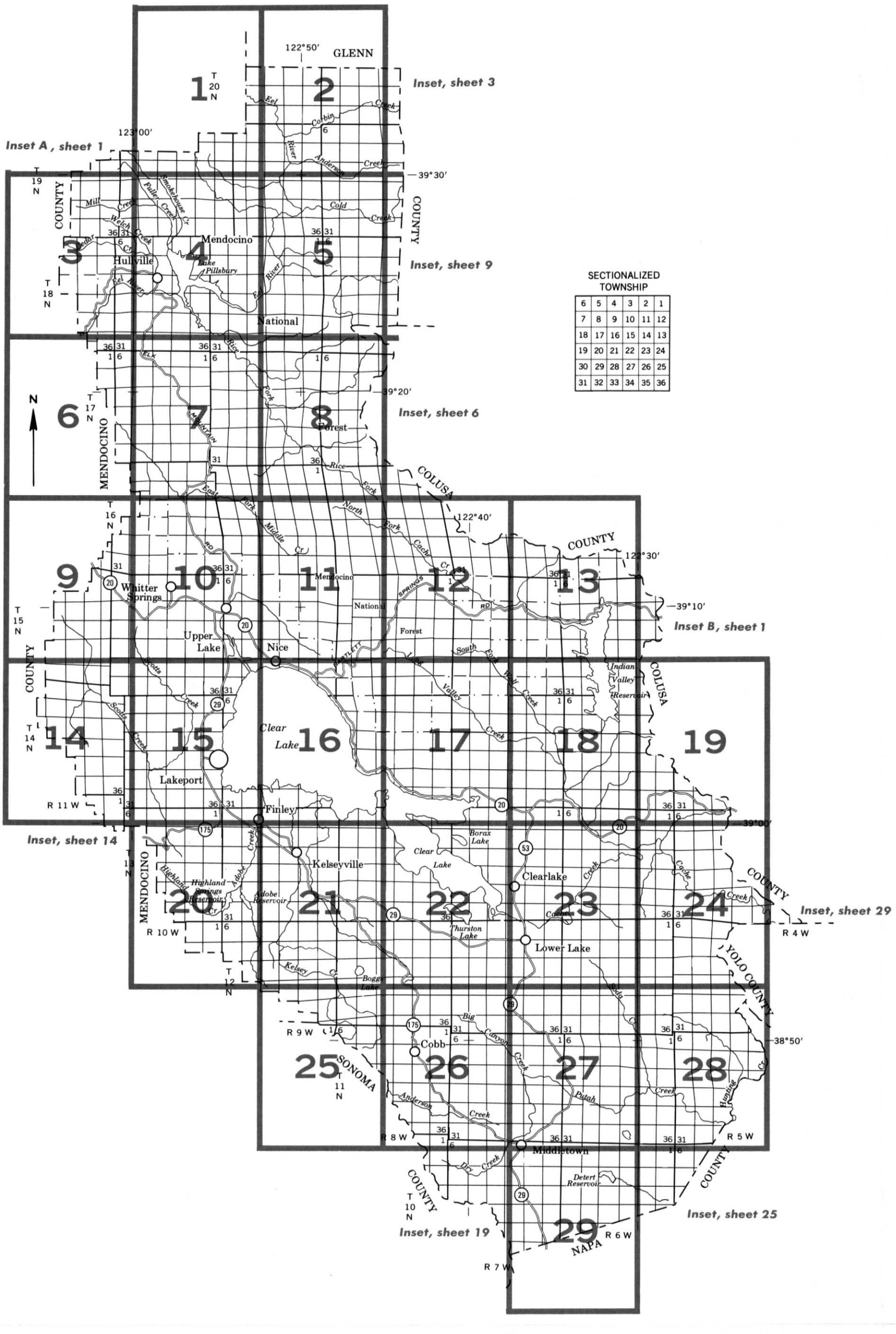
GENERAL SOIL MAP

LAKE COUNTY, CALIFORNIA

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km



SECTIONALIZED TOWNSHIP

6	5	4	3	2	1
7	8	9	10	11	12
18	17	16	15	14	13
19	20	21	22	23	24
30	29	28	27	26	25
31	32	33	34	35	36

INDEX TO MAP SHEETS

LAKE COUNTY, CALIFORNIA

Scale 1:316,800

1 0 1 2 3 4 5 Miles

1 0 5 10 Km

SOIL LEGEND

SYMBOL	NAME
101	Aiken-Sobrante association, 5 to 15 percent slopes
102	Aiken-Sobrante association, 15 to 30 percent slopes
103	Asbill clay loam, 5 to 8 percent slopes
104	Asbill clay loam, 8 to 15 percent slopes
105	Badland
106	**Bally-Phipps gravelly loams, 2 to 8 percent slopes**
107	Bally-Phipps complex, 15 to 30 percent slopes
108	Bally-Phipps-Haploxeralfs association, 30 to 75 percent slopes
109	**Bamtush-Neuns gravelly loams, 15 to 30 percent slopes**
110	Bamtush-Speaker-Sanhedrin gravelly loams, 30 to 50 percent slopes
111	Bamtush-Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes
112	Benridge-Konocti association, 15 to 30 percent slopes
113	Benridge-Konocti association, 30 to 50 percent slopes
114	Benridge-Sodabay loams, 8 to 15 percent slopes
115	Benridge-Sodabay loams, 15 to 30 percent slopes
116	Benridge Variant loam, 2 to 15 percent slopes
117	Bottlerock-Glenview-Arrowhead complex, 5 to 30 percent slopes
118	Bottlerock-Glenview-Arrowhead complex, 30 to 50 percent slopes
119	Bressa-Millsholm loams, 8 to 15 percent slopes
120	Bressa-Millsholm loams, 15 to 30 percent slopes
121	Clear Lake clay, drained, cool
122	Clear Lake Variant clay, drained
123	Cole clay loam, drained
124	Cole Variant clay loam
125	Cole Variant clay loam, calcareous substratum
126	Collayomi complex, 50 to 75 percent slopes
127	Collayomi-Aiken-Whispering complex, 5 to 30 percent slopes
128	Collayomi-Aiken-Whispering complex, 30 to 50 percent slopes
129	Collayomi-Whispering complex, 30 to 50 percent slopes
130	Deadwood-Sheetiron association, 50 to 75 percent slopes
131	Fluventic Haplaquolls, nearly level
132	Forbesville loam, 2 to 5 percent slopes
133	Forbesville loam, 5 to 15 percent slopes
134	Forward Variant-Kidd association, 30 to 50 percent slopes
135	Forward Variant-Kidd association, 50 to 75 percent slopes
136	Freezeout-Yollabolly very gravelly sandy loams, 30 to 50 percent slopes
137	Freezeout-Yollabolly very gravelly sandy loams, 50 to 75 percent slopes
138	Glenview-Arrowhead complex, 5 to 15 percent slopes
139	Glenview-Arrowhead complex, 15 to 30 percent slopes
140	Glenview-Bottlerock complex, 2 to 5 percent slopes
141	Henneke-Montara complex, 8 to 15 percent slopes
142	Henneke-Montara-Rock outcrop complex, 15 to 50 percent slopes
143	Henneke-Okiota complex, 30 to 50 percent slopes
144	Jafa loam, 2 to 5 percent slopes
145	Jafa loam, 5 to 15 percent slopes
146	Jafa complex, 5 to 30 percent slopes
147	Kelsey fine sandy loam
148	Kidd-Forward complex, 5 to 30 percent slopes
149	Kidd-Forward complex, 30 to 50 percent slopes
150	Kilaga Variant loam, 0 to 5 percent slopes
151	Konocti-Benridge complex, 50 to 75 percent slopes
152	Konocti-Hambright complex, 5 to 15 percent slopes
153	Konocti-Hambright complex, 15 to 30 percent slopes
154	Konocti-Hambright-Rock outcrop complex, 30 to 75 percent slopes
155	Konocti Variant-Konocti-Hambright complex, 2 to 15 percent slopes
156	Konocti Variant-Konocti-Hambright complex, 15 to 30 percent slopes
157	Landlow Variant silty clay loam
158	Lupoyoma silt loam, protected
159	Manzanita loam, 2 to 5 percent slopes
160	Manzanita loam, 5 to 15 percent slopes
161	Manzanita loam, 15 to 25 percent slopes
162	Manzanita gravelly loam, 2 to 8 percent slopes
163	Manzanita gravelly loam, 8 to 25 percent slopes
164	Maxwell clay loam, 0 to 2 percent slopes
165	Maxwell clay loam, 2 to 8 percent slopes
166	Maymen-Etsel-Mayacama complex, 15 to 30 percent slopes
167	Maymen-Etsel-Mayacama complex, 30 to 75 percent slopes
168	Maymen-Etsel-Snook complex, 15 to 30 percent slopes
169	Maymen-Etsel-Snook complex, 30 to 75 percent slopes
170	Maymen-Etsel-Speaker association, 30 to 50 percent slopes
171	Maymen-Hopland-Etsel association, 15 to 50 percent slopes
172	Maymen-Hopland-Mayacama complex, 9 to 30 percent slopes
173	Maymen-Hopland-Mayacama association, 30 to 50 percent slopes
174	Maymen-Hopland-Mayacama association, 50 to 75 percent slopes
175	Maymen-Millsholm-Bressa complex, 30 to 50 percent slopes
176	Maywood Variant sandy loam
177	Millsholm-Bressa loams, 30 to 50 percent slopes
178	Millsholm-Bressa-Hopland association, 30 to 50 percent slopes
179	Millsholm-Squawrock-Pomo complex, 30 to 50 percent slopes
180	Mocho Variant loam
181	Neice-Sobrante-Hambright complex, 15 to 30 percent slopes
182	Neice-Sobrante-Hambright complex, 30 to 75 percent slopes
183	Neuns-Bamtush-Deadwood association, 30 to 50 percent slopes
184	Neuns-Deadwood-Bamtush association, 50 to 75 percent slopes
185	Neuns-Decy-Sanhedrin complex, 30 to 50 percent slopes
186	Neuns-Sanhedrin-Deadwood complex, 30 to 50 percent slopes
187	Neuns-Sanhedrin-Deadwood complex, 50 to 75 percent slopes
188	Neuns-Sanhedrin-Speaker gravelly loams, 30 to 50 percent slopes
189	Neuns-Sheetiron-Deadwood complex, 30 to 50 percent slopes
190	Neuns-Sheetiron-Deadwood complex, 50 to 75 percent slopes
191	Neuns-Speaker gravelly loams, 15 to 30 percent slopes
192	Okiota-Henneke complex, 5 to 30 percent slopes
193	Okiota-Henneke-Dubakella association, 15 to 50 percent slopes
194	Oxalis Variant silt loam
195	Phipps complex, 5 to 15 percent slopes
196	Phipps complex, 15 to 30 percent slopes
197	Phipps complex, 30 to 50 percent slopes
198	Pomo-Bressa loams, 15 to 50 percent slopes
199	Riverwash
200	Rock outcrop-Etsel-Snook complex, 50 to 80 percent slopes
201	Sanhedrin-Kekawaka-Speaker complex, 15 to 30 percent slopes
202	Sanhedrin-Kekawaka-Speaker complex, 30 to 50 percent slopes
203	San Joaquin Variant fine sandy loam, 0 to 5 percent slopes
204	Sheetiron-Deadwood association, 30 to 50 percent slopes
205	Sheetiron-Deadwood association, 50 to 75 percent slopes
206	**Shortyork Variant-Yorkville-Squawrock association, 15 to 50 percent slopes**
207	Skyhigh-Asbill complex, 8 to 15 percent slopes
208	Skyhigh-Asbill complex, 15 to 50 percent slopes
209	Skyhigh-Millsholm loams, 15 to 50 percent slopes
210	**Skyhigh-Sleeper-Millsholm association, 8 to 15 percent slopes**
211	Skyhigh-Sleeper-Millsholm association, 15 to 30 percent slopes
212	Skyhigh-Sleeper-Millsholm association, 30 to 50 percent slopes
213	Sleeper Variant-Sleeper loams, 5 to 15 percent slopes
214	Sleeper Variant-Sleeper loams, 15 to 30 percent slopes
215	Sleeper Variant-Sleeper loams, 30 to 50 percent slopes
216	Sobrante-Collayomi-Whispering association, 15 to 30 percent slopes
217	Sobrante-Collayomi-Whispering association, 30 to 50 percent slopes
218	Sobrante-Guenoc-Hambright complex, 2 to 15 percent slopes
219	Sobrante-Guenoc-Hambright complex, 15 to 30 percent slopes
220	Sobrante-Guenoc-Hambright complex, 30 to 50 percent slopes
221	Sodabay loam, 5 to 15 percent slopes
222	Sodabay loam, 15 to 30 percent slopes
223	Sodabay-Konocti association, 5 to 30 percent slopes
224	Speaker-Marpa-Sanhedrin gravelly loams, 30 to 50 percent slopes
225	Speaker-Maymen-Marpa association, 30 to 50 percent slopes
226	Speaker-Maymen-Marpa association, 50 to 75 percent slopes
227	Speaker-Maymen-Millsholm association, 30 to 50 percent slopes
228	Speaker-Sanhedrin gravelly loams, 50 to 75 percent slopes
229	Speaker-Sanhedrin--Maymen association, 30 to 50 percent slopes
230	Speaker-Speaker Variant-Sanhedrin association, 5 to 30 percent slopes
231	**Squawrock-Shortyork Variant gravelly loams, 15 to 30 percent slopes**
232	Still loam
233	Still loam, stratified substratum
234	Still gravelly loam
235	Still-Talmage complex, 2 to 8 percent slopes
236	Stonyford-Guenoc complex, 30 to 50 percent slopes
237	Talmage very gravelly sandy loam
238	Tulelake silty clay loam, flooded
239	Tulelake silty clay loam, protected
240	Tyson-Neuns gravelly loams, 30 to 75 percent slopes
241	**Vitrandepts-Cinder land complex, 15 to 75 percent slopes**
242	Wappo loam, 2 to 8 percent slopes
243	Wappo loam, 8 to 15 percent slopes
244	Wappo Variant clay loam, 2 to 8 percent slopes
245	Whispering-Collayomi complex, 50 to 75 percent slopes
246	Wolfcreek gravelly loam
247	Wolfcreek loam
248	Xerofluvents, very gravelly
249	Xerofluvents-Riverwash complex
250	Yollabolly-Freezeout very gravelly sandy loams, 30 to 50 percent slopes
251	**Yollabolly-Rock outcrop-Freezeout complex, 50 to 75 percent slopes**
252	Yorktree-Hopland-Squawrock complex, 15 to 50 percent slopes
253	Yorkville-Pomo complex, 15 to 50 percent slopes
254	Yorkville-Yorktree-Squawrock association, 15 to 50 percent slopes
255	Yorkville Variant clay loam, 2 to 8 percent slopes

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

CULTURAL FEATURES

BOUNDARIES

- National, state or province
- County or parish
- Minor civil division
- Reservation (national forest or park, state forest or park, and large airport)
- Land grant
- Limit of soil survey (label)
- Field sheet matchline and neatline
- AD HOC BOUNDARY (label)
- Small airport, airfield, park, oilfield, cemetery, or flood pool
- STATE COORDINATE TICK
- LAND DIVISION CORNER (sections and land grants)

ROADS

- Divided (median shown if scale permits)
- Other roads
- Trail

ROAD EMBLEM & DESIGNATIONS

- Interstate
- Federal
- State
- County, farm or ranch

- RAILROAD
- POWER TRANSMISSION LINE (normally not shown)
- PIPE LINE (normally not shown)
- FENCE (normally not shown)

LEVEES

- Without road
- With road
- With railroad

DAMS

- Large (to scale)
- Medium or Small

PITS

- Gravel pit
- Mine or quarry

MISCELLANEOUS CULTURAL FEATURES

- Farmstead, house (omit in urban areas)
- Church
- School
- Indian mound (label)
- Located object (label)
- Tank (label)
- Wells, oil or gas
- Windmill
- Kitchen midden

WATER FEATURES

DRAINAGE

- Perennial, double line
- Perennial, single line
- Intermittent
- Drainage end
- Canals or ditches
- Double-line (label)
- Drainage and/or irrigation

LAKES, PONDS AND RESERVOIRS

- Perennial
- Intermittent

MISCELLANEOUS WATER FEATURES

- Marsh or swamp
- Spring lacre
- Well, artesian
- Well, irrigation
- Wet spot up to 2 acres
- 2 to 4 acres

SPECIAL SYMBOLS FOR SOIL SURVEY

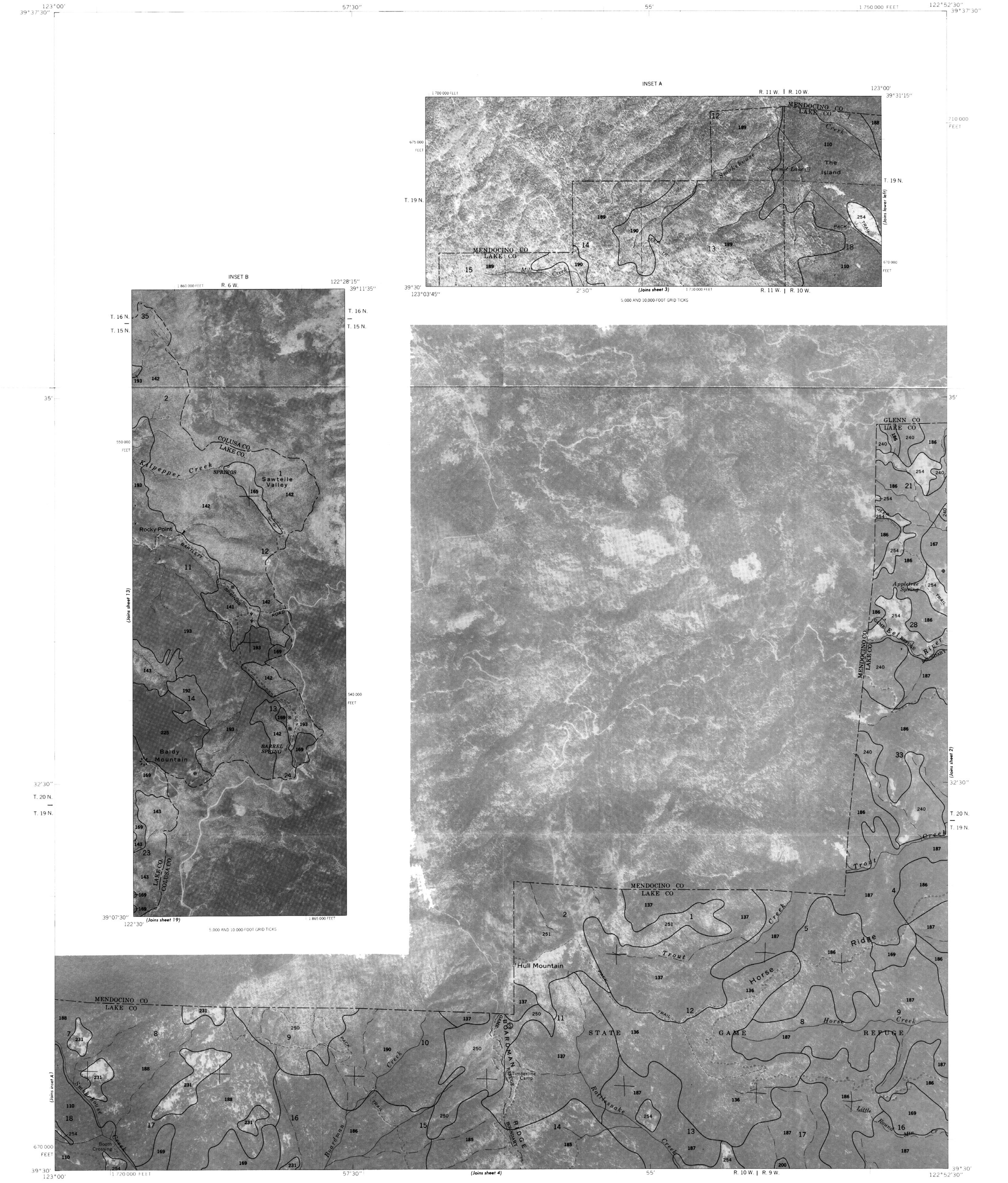
- SOIL DELINEATIONS AND SYMBOLS
- ESCARPMENTS
  - Bedrock (points down slope)
  - Other than bedrock (points down slope)
- SHORT STEEP SLOPE
- GULLY
- DEPRESSION OR SINK
- SOIL SAMPLE (normally not shown)
- MISCELLANEOUS
  - Blowout
  - Clay spot up to 2 acres
  - Gravelly spot up to 2 acres
  - Gumbo, slick or scabby spot (sodic)
  - Dumps and other similar non soil areas
  - Prominent hill or peak
  - Rock outcrop up to 2 acres (includes sandstone and shale) 2 to 4 acres
  - Saline spot
  - Sandy spot
  - Severely eroded spot up to 2 acres
  - Slide or slip (tips point upslope) up to 2 acres
  - Stony spot, very stony spot up to 2 acres
  - Slopes <15 percent 5 to 10 acres
  - Slopes>75 percent 5 to 10 acres
  - Serpentine soil spot up to 2 acres

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 1
SOIL SURVEY OF LAKE COUNTY, CALIFORNIA
(HULL MTN. AND PARTS OF SAN HEDRIN MTN. AND WILBUR SPRINGS NW QUADRANGLES)

INSET A

INSET B



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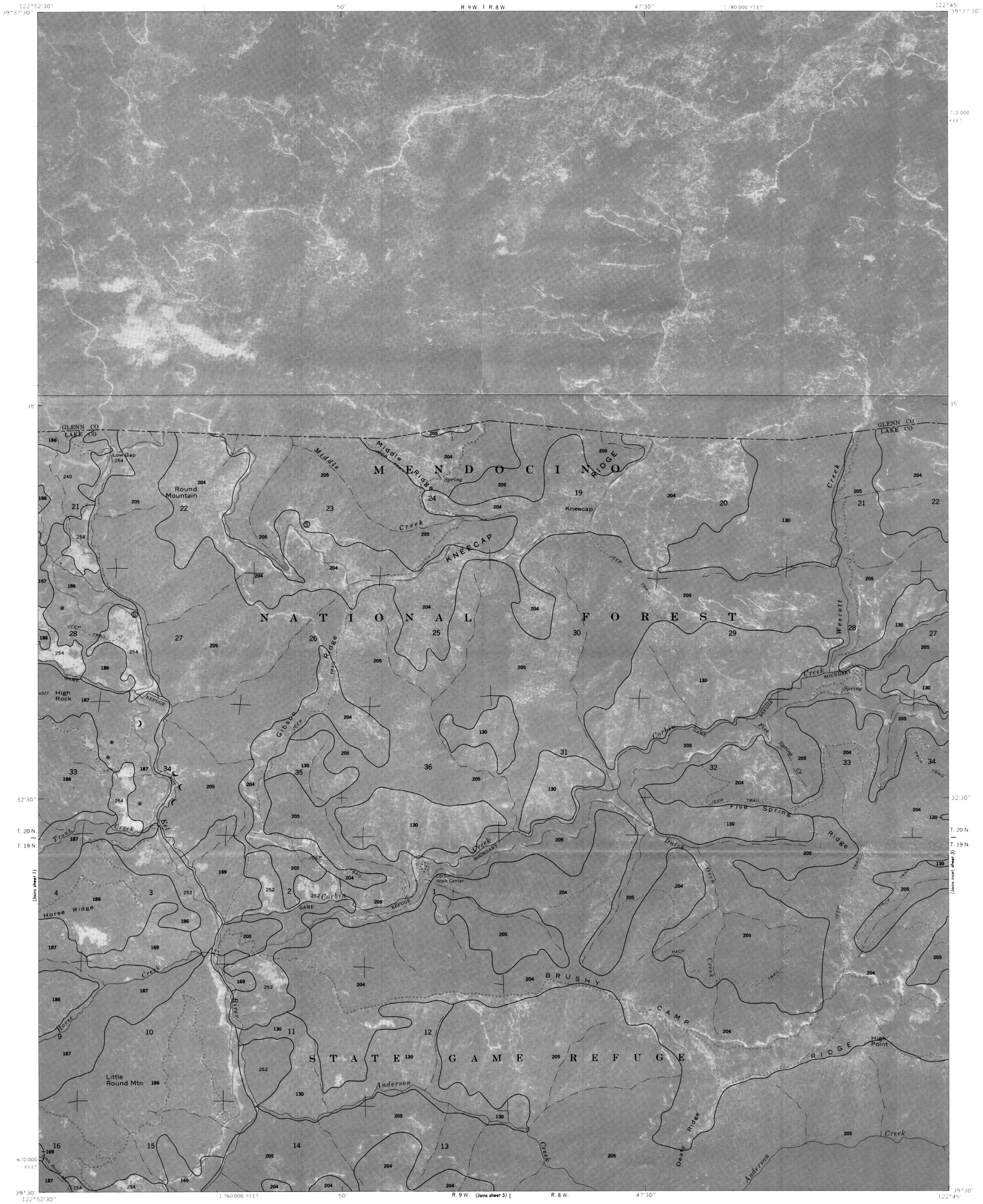
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 1

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 2
SOIL SURVEY OF LAKE COUNTY, CALIFORNIA
(KNEECAP RIDGE QUADRANGLE)



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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 2

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 3
SOIL SURVEY OF LAKE COUNTY, CALIFORNIA
(POTTER VALLEY NE AND PART OF FELKNER HILL QUADRANGLES)

123°07'30"
39°30'
(Joins inset A, sheet 1)
1 710 000 FEET
R. 11 W. | R. 10 W.
123°00'
39°30'

122°43'45"
39°35'
1 790 000 FEET
R. 8 W.
690 000 FEET
T. 19 N.
T. 18 N.
T. 20 N.
T. 19 N.
(Joins sheet 2)
(Joins sheet 4)
(Joins sheet 6)
39°22'30"
123°07'30"
1 690 000 FEET
39°22'30"
123°00'
670 000 FEET
39°30'
122°45'
(Joins inset, sheet 9)
1 793 000 FEET

MENDOCINO NATIONAL FOREST

GLENN CO
LAKE CO
MENDOCINO CO.
LAKE CO.
NATIONAL FOREST BOUNDARY
GAME REFUGE BOUNDARY
STATE GAME BOUNDARY
INDEFINITE
PRIVATE
JEEP TRAIL
TRAIL
PACK TRAIL
COUNTY ROAD
SPRING
Tule Lake
Mill Creek
Fuller Creek
Ericson Ridge
Welch Creek
Pine Kop
Corbin Creek
Dutch Oven Creek
Hayward Spring
Brushy Camp Ridge
The Big Openings
Cedar Creek
Dogwell Creek
Alder Creek
Eel River
Elk Mountain
Pine Mtn.

3,000 AND 10,000-FOOT GRID TICKS

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1 3/4 1/2 1/4 0 1 2 MILES
1 0·5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 3

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 4
SOIL SURVEY OF LAKE COUNTY, CALIFORNIA
(LAKE PILLSBURY QUADRANGLE)

123°00' 39°30' — 57'30" — (Joins sheet 1) — 55' — R. 10 W. | R. 9 W. — 1 750 000 FEET — 122°52'30" 39°30'

27'30" — T. 19 N. — T. 18 N.

(Joins sheet 3) — 25' — 630 000 FEET — (Joins sheet 5)

39°22'30" — 123°00' — 1 720 000 FEET — 57'30" — (Joins sheet 7) — R. 10 W. | R. 9 W. — 55' — 39°22'30" — 122°52'30"

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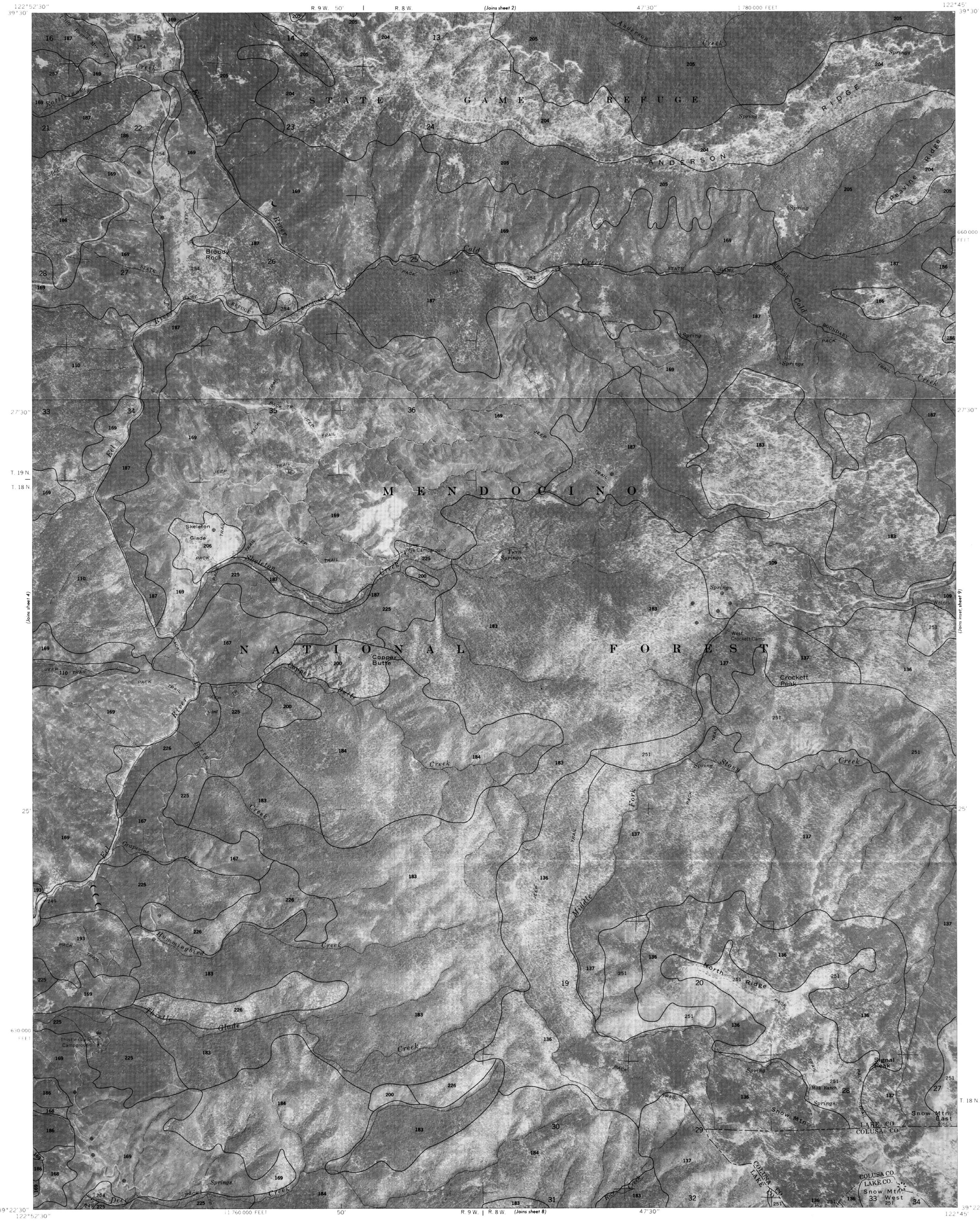
1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 4



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SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 5

SOIL SURVEY OF LAKE COUNTY, CALIFORNIA

(POTTER VALLEY AND PARTS OF FOUTS SPRINGS QUADRANGLE)

123°07'30" 5' 2'30" 1 710 000 FEET R. 11 W. | R. 10 W. (Joins sheet 3) 123°00'
39°22'30" 39°22'30"

T. 18 N. — T. 17 N. — 620 000 FEET

20' 20'

17'30" 17'30"

T. 17 N. — T. 16 N. — 580 000 FEET

39°15' 123°07'30" 1 690 000 FEET 5' 2'30" R. 11 W. | R. 10 W. 123°00'

MENDOCINO CO. / LAKE CO.

MENDOCINO NATIONAL FOREST

Pine Mtn Lookout 5,747'

Pine Mtn Spring

Pine Mountain

Buckhell Creek

Garrett Mtn Lookout 5,961'

McCreary Glade

Middle Fork

Middle Mountain

Firebreak

Spring

(Joins sheet 7)

INSET A

122°43'25" 1 790 000 FEET 39°22'30"

T. 18 N. — T. 17 N. — 620 000 FEET

(Joins sheet 8)

COLUSA CO. / LAKE CO.

Spring

Jack Pack Trail

615 000 FEET

39°20'50" 122°45' R. 8 W. 1 795 000 FEET

5,000 AND 10,000-FOOT GRID TICKS

INSET B

122°41'40" 39°17' 1 790 000 FEET R. 8 W.

T. 17 N. — T. 16 N. — 585 000 FEET

COLUSA CO. / LAKE CO.

Horse Glade Camp

Richardson Glade

Freezeout Spring

Lookout Tower

Goat Mtn

580 000 FEET

(Joins sheet 8)

(Joins sheet 12)

39°15' 122°45' 42'30" 1 800 000 FEET

5,000 AND 10,000-FOOT GRID TICKS

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1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 6

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 7

122°52'30" 50' R. 9 W. | R. 8 W. (Joins sheet 5) 47'30" 1 780 000 FEET 122°45' 39°22'30"

T. 18 N. — T. 17 N.

620 000 FEET

(Joins inset A, sheet 6)

Rice Valley

Potato Hill 1405

Big Spring

Snow Mountain Horse

Blue Slides Ridge

MENDOCINO NATIONAL FOREST

LONG RIDGE

HALE RIDGE

Big Ridge

Sumner Ridge

French Ridge

Little Horse Mtn

Blue Slides Lake

Fir Root Spring

Water Tank Campground

Bear Creek Station

Water Tank

Bear Creek Campground

Crabtree Hot Springs

Rabbit Glade Spring

Knobcone Spring

Mudcrow Spring

Youngs Corral Spring

Sylar Spring

Timber Lake

Catfish Pond

Mauser Glade

North Glade

Barker Springs

Potato Hill Springs

Blue Slides Spring

Spring

Springs

Creek

Fork

Ridge

Trail

Pack

Jeep

Int

LAKE CO
COLUSA CO

(Joins sheet 7)

(Joins sheet 11)

T. 17 N. — T. 16 N.

1 760 000 FEET

122°52'30" 50' (Joins sheet 11) 47'30" 122°45' 39°15'

(Joins inset B, sheet 6)

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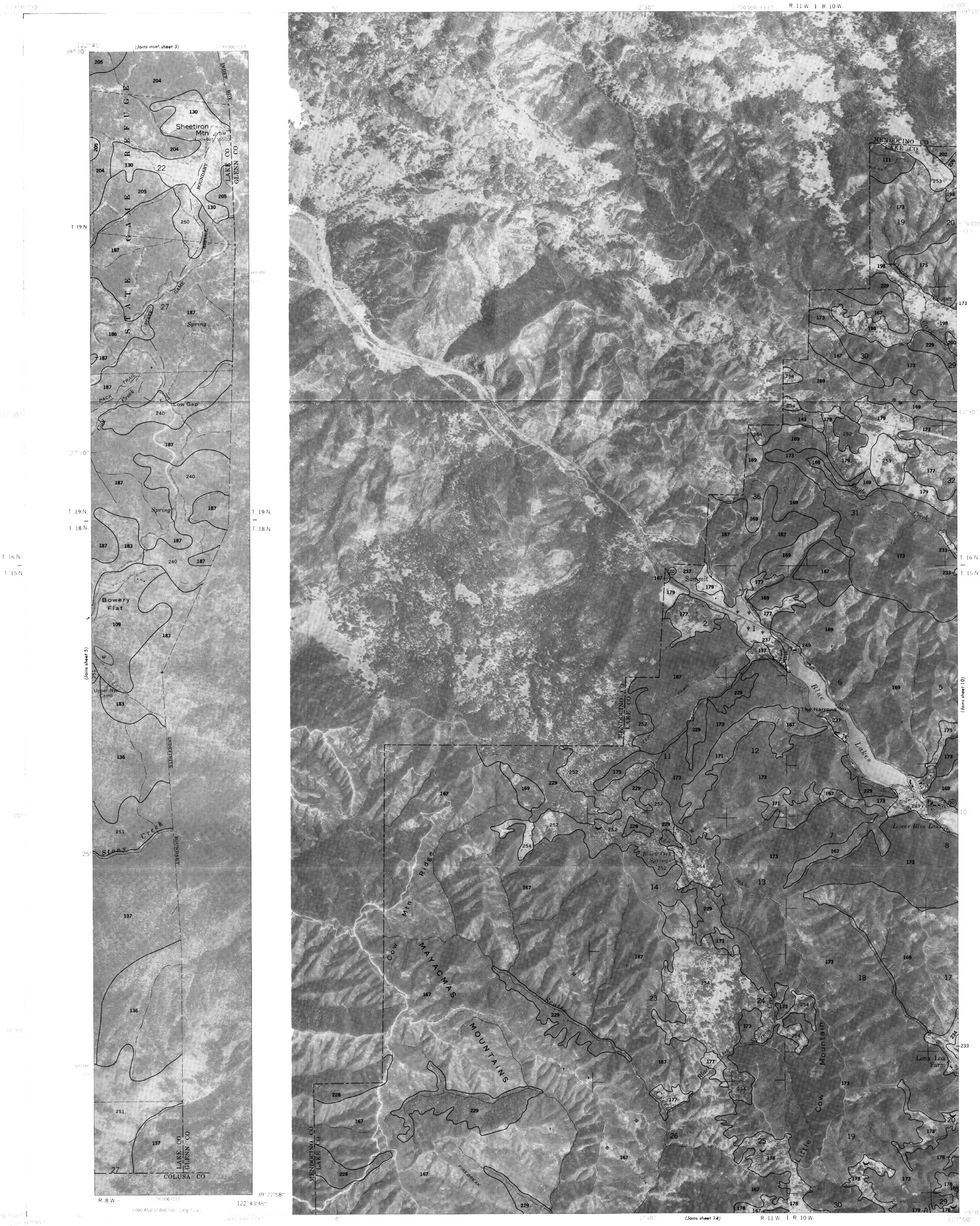
1 0 1 2 3 4 MILES
1 0 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 8

SOIL SURVEY OF LAKE COUNTY, CALIFORNIA

(COW MTN. AND PART OF ST. JOHN MTN. QUADRANGLES)



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1 3/4 1/2 1 4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 9

123°00' 57'30" (Joins sheet 7) R. 10 W. R. 9 W. 55' 1 750 000 FEET 122°52'30"
39°15' 39°15'

MENDOCINO CO
LAKE CO
Plank Cabin Spring
Twin Knobs
Piney Ridge
Piney
Spring
Middle Fork
Rattle Creek
Ridge Road
Madrone Spring
McCabe Point
MIDDLE MOUNTAIN
Chair Creek
UPPER LAKE RANCHERIA (POMO)
Middle Creek
MENDOCINO NATIONAL FOREST
Hog Point
Salt Flat
Salt Flat Creek
FIREBREAK
Elk Canyon
NATIONAL FOREST BOUNDARY
TRAIL
JEEP
Hells Peak
Hunter Point
Lookout
Kirkpatrick Creek
Elk Creek
Hunter Ranch
Gaging Sta
White Rock Canyon
McCabe Ridge
Deer Canyon
Youngs Peak
Phelps Ridge
Dave Phelps Ridge
Charlie Alley Peak
Wyman Glade
MOUNTAIN ROAD
Cooper Trail
Bachelor Valley
Witter Springs
Community Club
Witter Springs P O
Saratoga Springs
Lower Blue Lake
Fall Canyon
White Rock Mtn
Dart Creek
White Rock Trail
Griner Peak
Glen Eden Sch
Poe Mtn
Sleeper Peak
Bachelor Valley Road
Middle Creek Valley
Clover Valley
John Alley
Sam Alley Ridge
Ranger Station
Union High Sch
Upper Lake
Hoskack Ridge
Gaging Station
Upper Lake Substation
Bloody Island
Bloody Island Massacre Historical Marker
RECLAMATION ROAD
ROBINSON RANCHERIA
Robinson Creek
Middle Creek Slough
Pump
Tule Lake
T. 16 N.
T. 15 N.
(Joins sheet 9)
(Joins sheet 11)
540 000 FEET
39°07'30" 123°00' 1 720 000 FEET 57'30" (Joins sheet 15) 55' R. 10 W. | R. 9 W. 122°52'30" 39°07'30"

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 10

(Joins sheet 8)

(Joins sheet 10)

(Joins sheet 12)

(Joins sheet 16)

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SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 11

122°45′ 39°15′ (Joins inset B, sheet 6) R. 8 W. | R. 7 W. 122°37′30″ 39°15′

1 820 000 FEET 570 000 FEET

MENDOCINO NATIONAL FOREST

NATIONAL FOREST BOUNDARY

COLUSA CO. LAKE CO.

T. 16 N. | T. 15 N. (Joins sheet 11)

T. 16 N. | T. 15 N. (Joins sheet 13)

1 840 000 FEET

39°07′30″ 122°45′ 1 780 000 FEET (Joins sheet 17) R. 8 W. | R. 7 W. 39°07′30″ 122°37′30″

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 12

122°37'30"
39°15'
R. 7 W. | R. 6 W.
1850 000 FEET
122°30'
39°15'
570 000 FEET

COLUSA CO. / LAKE CO.
Pacific Ridge
Pacific Point
Kanaka Glade
Spanish Creek
Lone Pine Ridge
Wylley Glade
MENDOCINO NATIONAL FOREST
Stanton Creek
NATIONAL FOREST BOUNDARY
Stanton Glade
Stove Glade
Indian Ridge
Spanish Creek
Complexion Canyon
Kilpepper Creek
NEW BARTLETT SPRINGS ROAD
HOUGH SPRINGS
Cache Creek
Hough Ridge
Long Canyon
LITTLE INDIAN VALLEY RESERVOIR
Bean Canyon
Bean Glade
Rocky Reister Canyon Ridge
Wells Canyon
FOOT TRAIL

T. 16 N.
T. 15 N.

(Joins sheet 12)
(Joins inset B, sheet 1)
(Joins sheet 18)
540 000 FEET
1830 000 FEET

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 13

123°07'30" 39°07'30" 5' (Joins sheet 9) 2'30" R. 11 W. | 1 710 000 FEET R. 10 W. 123°00' 39°07'30"

530 000 FEET

T. 15 N. — T. 14 N.

MENDOCINO CO. LAKE CO.

Lyons Valley Creek

Lyons Valley JEEP TRAIL

Scotts Creek

Little Cow Mountain

Red Mass 2775

Spring JEEP TRAIL

Creek

Hendricks

Eightmile Ridge JEEP TRAIL

Willow Creek

Morris Ranch

Valley

Fountain Of Youth Camp

Vandenburg Ridge

Red Mtn Camp

Red Mtn Basin

Basin Ridge

Panther Creek

Panther Ridge

LAKE CO. MENDOCINO CO.

Fourpoint Canyon

South Willow Creek Camp

Rocky Lake

Bushy Camp

Shin Skin Ridge

Spruce Ridge

Trail Ridge

Alder Creek

Tucker Ridge

Tucker Camp

Woods Camp

Simms Camp

Foumile Glade

Knobcone Camp

Jerky Camp

Benmore Ridge Camp

Buck Ridge

Boundary Basin

Benmore Valley

Riley Valley

Dorst Ranch

HOPLAND INDIAN RESERVATION

LAKE CO. MENDOCINO CO.

T. 15 N. — T. 14 N.

(Joins sheet 15)

T. 14 N. — T. 13 N.

(Joins lower right) R. 11 W. | R. 10 W. 123°00' 39°00'

1 710 000 FEET

T. 13 N.

486 000 FEET

483 000 FEET

38°59' 123°02'

1 715 000 FEET

3,000 AND 5,000-FOOT GRID TICKS

490 000 FEET

39°00' 123°07'30"

1 690 000 FEET 5' 2'30"

(Joins inset) R. 11 W. | R. 10 W. 39°00' 123°00'

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1 3/4 1/2 1/4 0 1 2 MILES

1 0.5 0 1 2 KILOMETERS

SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 14

123°00' 57'30" (Joins sheet 10) 55' R 10 W | R 9 W 1 750 000 FEET 122°52'30"
39°07'30" 39°07'30"

T. 15 N.
T. 14 N.
520 000 FEET
5'
5'
2'30"
2'30"
(Joins sheet 14)
(Joins sheet 16)
T. 14 N.
T. 13 N.
490 000 FEET

Scotts Creek
Dorr Creek
Scotts Creek
Lyons Creek
Rodman Slough
Hidden Lake
Eckhoff Creek
Eachus Lake
Burger Lake
Ora Lake
Orr Peak
Lakeport Peak
Scotts Mtn
Buzzard Rock
Rocky Pt
Tule Island
Berger Bay
Rumsey Bay
Reeves Pt
Willow Pt
Stony Pt
Finley
Mayacmas Mts
Boundary Ridge
McGregor Ridge
McGregor Canyon
Bennett Creek
Manning Creek
Forbes Creek
Todd Creek
Riggs Road
Todd Road
Scotts Valley Road
Lucerne Cutoff Road
Reeves Lane
Big Valley Rancheria
Scotts Valley Rancheria
Westlake Sch
Lambert
Lakeside Hospital
Gaging Sta
Pumphouse
Water
Brewery Hill
Stony Pt
Sewage Disposal
Radio Towers
Gas
Cem
Grange Hall
Union High Sch
Gaging Sta
PO
LAKEPORT
SCOTTS VALLEY RANCHERIA
ELEVATION 1326
C L E A R L A K E
B I G V A L L E Y

(Joins sheet 20)

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 15

122°52'30" 39°07'30" — 181 — 50' — (Joins sheet 11) — R. 9 W. | R. 8 W. — 47'30" — 1 780 000 FEET — 122°45' 39°07'30"

T. 15 N. — 530 000 FEET — T. 15 N. — T. 14 N.

5' — 2'30" — 500 000 FEET

(Joins sheet 15) — (Joins sheet 17)

1 760 000 FEET — 50' — (Joins sheet 21) — R. 9 W. | R. 8 W. — 47'30" — 39°00' 122°52'30" — 122°45'

T. 14 N. — T. 13 N.

Lucerne (QM 1932)
Nice
Laurel Beach
Water
LUCERNE CUTOFF ROAD
BARTLETT SPRINGS ROAD
NATIONAL FOREST BOUNDARY
JEEP TRAIL
HIGH VALLEY ROAD
Long Valley Creek
South Fork
Morrison Creek
Ridge
Pine Mtn
VABM 2533
Pepperwood Grove
Pierce Canyon
Paradise Valley
Kono Tayee Point
THE NARROWS
Shag Rock
Buckingham Park
Henderson Point
Horseshoe Bend
Big Soda Spr
SODA BAY
Soda Bay
Benson VABM 2251
Little Borax Lake
Dali-Dona VABM 1916
Park Hdqrs
Dorn Bay
Cole Creek
CLEAR LAKE STATE PARK
HILLSEY CREEK
Quercus Point
Long Tule Point
CLEAR LAKE
ELEVATION 1328
BIG VALLEY
Finley
FINLEY ROAD
SODA BAY ROAD
GADDY ROAD
BROWN DR
McGaugh Slough
Adobe Creek
Travel Pit
Well
Wells
Sylar

This soil survey map was compiled by the U.S. Department of Agriculture, Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of the Interior, Geological Survey, from 1974 and 1977 aerial photography. Coordinate grid ticks and land division corners, if shown, are approximately positioned.

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 16

(Joins sheet 12) R. 8 W. | R. 7 W.

122°45' 42'30" 40' 1 820 000 FEET 122°37'30"
39°07'30" 530 000 FEET 39°07'30"

MENDOCINO NATIONAL FOREST
NATIONAL FOREST BOUNDARY
Evans Peak
Reister Knoll
Reister Canyon
Wolf Creek
Springer Flat
Long Valley
Rose Canyon
Ridge
South Fork
Fuller Canyon
Quartz Canyon
Wolf Creek
Bald Hill Canyon
Cold Ridge
Doe Canyon
Garner Ranch
Kennedy Ranch
Spring
Well
water
T. 15 N.
T. 14 N.
5'
(Joins sheet 16)
(Joins sheet 18)
2'30"
HIGH VALLEY
HIGH VALLEY ROAD
Sulphur Canyon
FOREST BOUNDARY
NATIONAL
VABM Oaks
2306
Fire Control Station
JEEP TRAIL
Paradise Valley
Glenhaven
Buckingham Point
THE NARROWS
INDIAN BEACH
East Lake Sch
Clearlake Oaks
RIDGE
Round Mtn
Gravel Pit
Anderson Island
Weekend Island
Fruit Island
Sulphur Bank Point
Bloom
Paradise Cove
Honeymoon Cove
Stubbs Island
Rattlesnake Island
SULPHUR BANK RANCHERIA
Sulphur Bank
Pump
CLEAR LAKE
T. 14 N.
T. 13 N.
490 000 FEET
39°00'
122°45' 1 790 000 FEET 42'30" (Joins sheet 22) R. 8 W. | R. 7 W. 40' 122°37'30"

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 17

122°37'30" 39°07'30" — R. 7 W. | R. 6 W. — (Joins sheet 13) — 122°30' 39°07'30"

MENDOCINO NATIONAL FOREST

BOUNDARY — APPROXIMATE

Blodgett Canyon · Kattenburg Canyon · Zimory Canyon · Quartz Canyon · Saltlick Canyon · Wolf Canyon · Bald Hill · Cold Canyon · Doe Creek · Wilson Glade · Panther Glade · Canyon · Chalk Mountain · QUARRY · Cache Creek · Paradise Canyon · Cold Springs Canyon · Box Canyon · Valley Creek · Lone · Salt Canyon · CROSS SPRING · Hog Hollow Creek · Sweet Hollow Creek · Soda Canyon · Benmore Canyon · Indian Creek · Red Rocks · Middle Creek · Grizzly Canyon

LITTLE INDIAN VALLEY RESERVOIR

SULPHUR SPRING

JEEP TRAIL · GRAVEL PIT · water

T. 15 N. — T. 14 N.

T. 14 N. — T. 13 N.

(Joins sheet 17) (Joins sheet 19)

1 830 000 FEET · 490 000 FEET

R. 7 W. | R. 6 W. — (Joins sheet 23) — 39°00' 122°37'30" — 122°30'

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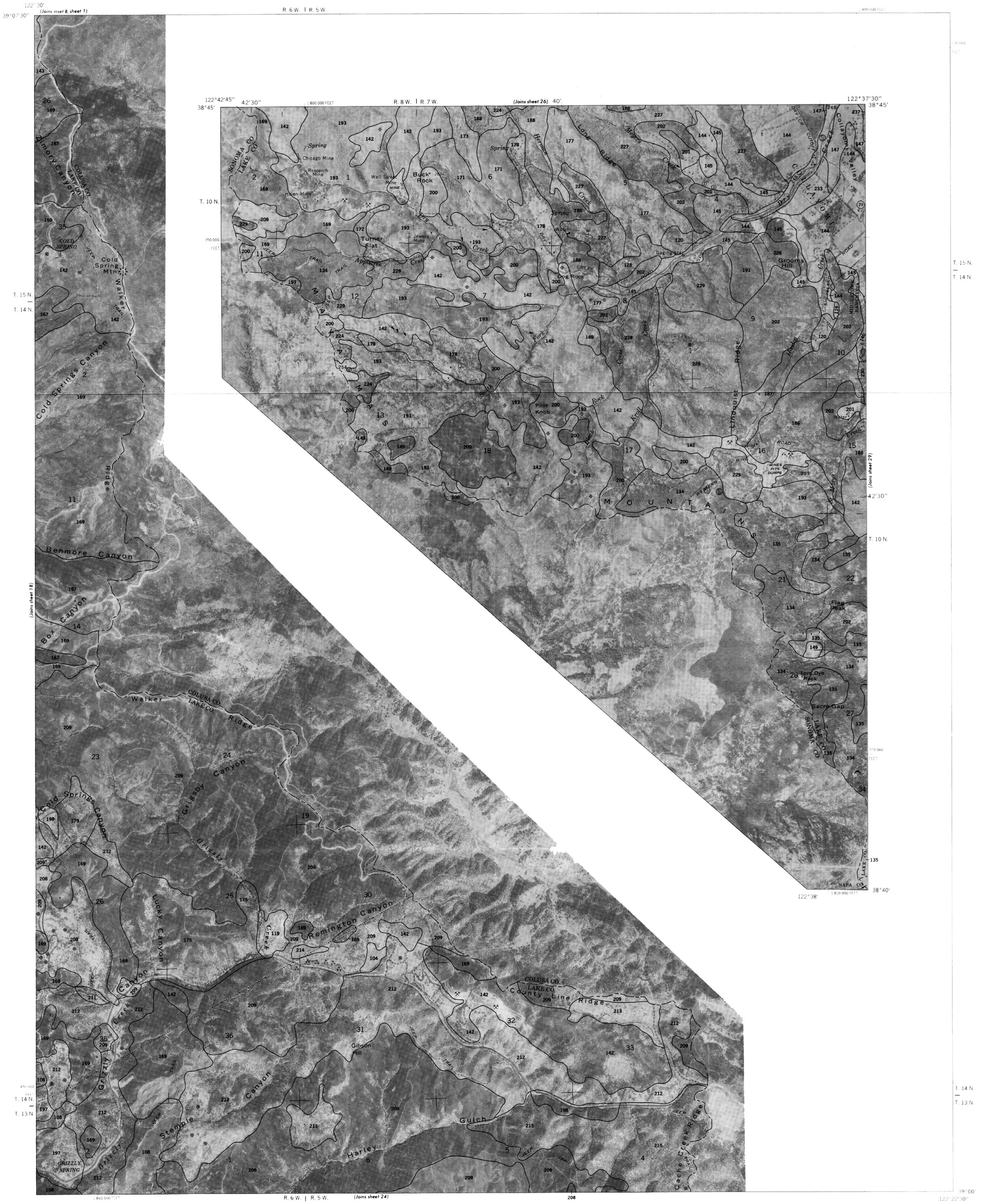
1 3/4 1/2 1/4 0 1 2 MILES
1 0·5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 18



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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 19

123°00′ 57′30″ (Joins sheet 15) 55′ R. 10 W. | R. 9 W. 1 750 000 FEET 122°52′30″
39°00′ (Joins inset, sheet 14) 480 000 FEET (Joins sheet 21)
57′30″ T. 13 N. T. 12 N. 55′ 450 000 FEET
38°52′30″ 1 720 000 FEET 57′30″ R. 10 W. 55′ | R. 9 W. 38°52′30″ 122°52′30″

LAKE CO
MENDOCINO CO

South Fork Scotts Creek
Manning Creek
Mathews Creek
Adobe Creek
Dongvan Valley
Highland Springs Creek
Cow Glade
Big Valley
Adobe Creek
Hoil Creek

HOPLAND
HOPLAND GRADE ROAD
ADOBE CREEK ROAD
MATHEWS ROAD
GEORGE ROAD
LAMPSON AIRPORT
ARGONAUT ROAD
VOIGT ROAD
MERRITT ROAD
DAVIS CREEK ROAD
SMITH LANE
BELL HILL ROAD
JEEP TRAIL
HIGHLAND SPRINGS ROAD
ADOBE CREEK ROAD
Big Valley Community Center
Highland Springs Gaging Station
Gaging Station
Mineral Spring
Spring
Chicken Springs Reservoir
Gilliam Rock
High Valley
water

MAYACMAS MOUNTAINS

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1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 20

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 21

122°45' 42'30" (Joins sheet 17) R. 8 W. | R. 7 W. 40' 1 820 000 FEET 122°37'30"
39°00' 39°00'
57'30" 57'30"
480 000 FEET
T. 13 N. — T. 12 N.
55'
450 000 FEET
38°52'30" 1 790 000 FEET 42'30" (Joins sheet 26) R. 8 W. | R. 7 W. 40' 38°52'30"
122°45' 122°37'30"

(Joins sheet 21) (Joins sheet 23)

Clear Lake
Sulphur Bank
Sulphur Bank Ridge
Water
Pirates Cove
Borax
Borax Lake
Fraser Pt
Monitor Pt
Monitor I
Godseneck Pt
Chamisa Gap
Oak Cove
Audrey
Bald Mtn
Clearlake Park
Gravel Pit
Burns Valley Sch
Drive-in Theatre
Peacock Pt
Clearlake Highlands
Konocti Bay
Wheeler Point
Wheeler
Baylis Pt
Jones Bay
Pt Lakeview
Rocky Pt
Jago Bay
Luebow Point
Brawns Landing
Indian Island
Ely Flat
Counterfeit Hill
Sugarloaf
Plum Flat
Thurston Creek
Thurston Lake
Gibsby Draw
Garner
Slater Island
Hesse Flat
Manning Flat
Roundtop Mtn
The Dell
Dry Lake
Pinkeye Lake
Wildcat Canyon
Perini Hill
Mt Hannah
Mt Hannah Lodge
Sunrise Vista
Salminas Resort
Seigler Mtn
Seigler Spgs
Siegler Canyon
Bergs Airport
Burns Valley

1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24000

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LAKE COUNTY, CALIFORNIA NO. 22

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1 3/4 1/2 1/4 0 1 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 23

SOIL SURVEY OF LAKE COUNTY, CALIFORNIA

(WILSON VALLEY QUADRANGLE)

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 24

122°52'30" 38°52'30" 50' (Joins sheet 21) R. 9 W. | R. 8 W. 47'30" 1 780 000 FEET 122°45' 38°52'30" 440 000 FEET

Adobe Cr. JEEP TRAIL Rabbit Valley Kelsey Creek Sulphur Creek SULPHUR CR ROAD Binkley Ranch Glenbrook Caldwell Pines High Creek LAKE CO MENDOCINO CO SONOMA CO LAKE CO Cemetery

T. 12 N. — T. 11 N. 50' (Joins sheet 26)

(Joins sheet 28) R. 6 W. | R. 5 W. 27'30" 1 870 000 FEET 122°25'36" 38°45'

Goat Hill Guenoc VABM 1751 Lower Bohn Lake Bohn Valley Upper Bohn Lake G U E N O C Butts Canyon Black Oak Villa SUTTS CANYON ROAD BOUNDARY APPROXIMATE LAKE CO NAPA CO LAKE CO SONOMA CO

390 000 FEET 380 000 FEET T. 10 N. 47'30" 42'30" 400 000 FEET 38°41'45" 122° 30' 1 860 000 FEET R. 6 W. | R. 5 W.

(Joins sheet 29)

38°45' 122°52'30" 1 760 000 FEET 50' R. 9 W. | 47'30" R. 8 W. 38°45' 122°45'

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1 3/4 1/2 1/4 0 1 2 MILES
1 0 5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 25

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

122°37'30" 38°52'30" 35' R. 7 W. | R. 6 W. (Joins sheet 23) 32'30" 1 850 000 FEET 122°30' 38°52'30" 440 000 FEET

T. 12 N. — T. 11 N.

50'

47'30" 410 000 FEET

(Joins sheet 26) (Joins sheet 28)

Excelsior Valley
Little High Valley
Stienhart Lakes
Hidden Lake
Coyote Valley
Long Valley
Collayomi
Guenoc
Middletown (BM 1105)
McCreary Lake SPILLWAY 973
Military Reservation 27
Gallagher
Hells Half Acre
Cockerell Canyon
Buttis Canyon
Spruce Grove
Gamble Road
Asbill Creek
Putah Creek
Coyote Creek
Harbin Creek
Crazy Creek
Buckeye Creek
Big Canyon Creek
Cemetery
Well
water
int

38°45' 122°37'30" 1 830 000 FEET 35' (Joins sheet 29) 32'30" 122°30' 38°45'

1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 27

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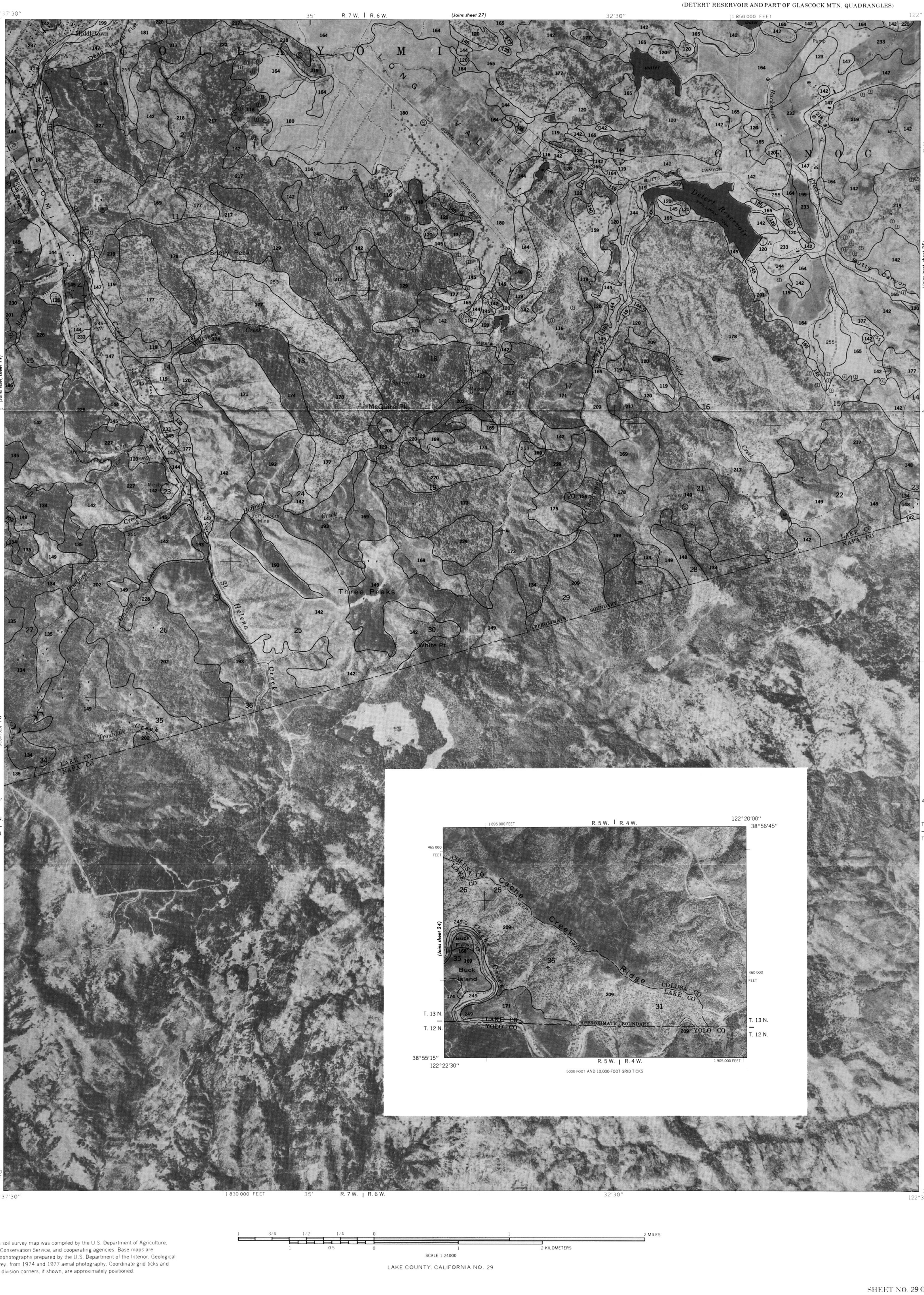
1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 28

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SHEET NO. 29
SOIL SURVEY OF LAKE COUNTY, CALIFORNIA
(DETERT RESERVOIR AND PART OF GLASCOCK MTN. QUADRANGLES)



5000-FOOT AND 10,000-FOOT GRID TICKS

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1 3/4 1/2 1/4 0 1 2 MILES
1 0.5 0 1 2 KILOMETERS
SCALE 1:24000

LAKE COUNTY, CALIFORNIA NO. 29